# Maintenance and Service Guide

## HP Compaq 8000 and 8080 Elite Business PC

**HP Compaq 8000 and 8080 Elite Business PC**

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# About This Book

⚠ **WARNING!** Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.

△ **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

**NOTE:** Text set off in this manner provides important supplemental information.

# Table of contents

# 1 Installing and Customizing the Software

If your computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Additional information is available in online help after you install the operating system.

**NOTE:** If the computer was shipped with Windows Vista or Windows 7 loaded, you will be prompted to register the computer with HP Total Care before installing the operating system. You will see a brief movie followed by an online registration form. Fill out the form, click the **Begin** button, and follow the instructions on the screen.

**CAUTION:** Do not add optional hardware or third-party devices to the computer until the operating system is successfully installed. Doing so may cause errors and prevent the operating system from installing properly.

**NOTE:** Be sure there is a 10.2-cm (4-inch) clearance at the back of the unit and above the monitor to permit the required airflow.

## Installing the Windows Operating System

The first time you turn on the computer, the operating system is installed automatically. This process takes about 5 to 10 minutes, depending on which operating system is being installed. Carefully read and follow the instructions on the screen to complete the installation.

**CAUTION:** Once the automatic installation has begun, DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE. Turning off the computer during the installation process may damage the software that runs the computer or prevent its proper installation.

**NOTE:** If the computer shipped with more than one operating system language on the hard drive, the installation process could take up to 60 minutes.

If your computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Additional information is available in online help after you install the operating system.

## Downloading Microsoft Windows Updates

1. To set up your Internet connection, click **Start** > **Internet Explorer** and follow the instructions on the screen.
2. Once an Internet connection has been established, click the **Start** button.
3. Select the **All Programs** menu.

4. Click on the **Windows Update** link.

   In Windows Vista and Windows 7, the **Windows Update** screen appears. Click **view available updates** and make sure all critical updates are selected. Click the **Install** button and follow the instructions on the screen.

   In Windows XP, you will be directed to the **Microsoft Windows Update Web site**. If you see one or more pop-up windows that ask you to install a program from http://www.microsoft.com, click **Yes** to install the program. Follow the instructions on the Microsoft Web site to scan for updates and install critical updates and service packs.

   It is recommended that you install all of the critical updates and service packs.

5. After the updates have been installed, Windows will prompt you to reboot the machine. Be sure to save any files or documents that you may have open before rebooting. Then select **Yes** to reboot the machine.

# Installing or Upgrading Device Drivers (Windows systems)

When installing optional hardware devices after the operating system installation is complete, you must also install the drivers for each of the devices.

If prompted for the i386 directory, replace the path specification with `C:\i386`, or use the **Browse** button in the dialog box to locate the i386 folder. This action points the operating system to the appropriate drivers.

Obtain the latest support software, including support software for the operating system from http://www.hp.com/support. Select your country and language, select **Download drivers and software (and firmware)**, enter the model number of the computer, and press Enter.

# Customizing the Monitor Display (Windows systems)

If you wish, you can select or change the monitor model, refresh rates, screen resolution, color settings, font sizes, and power management settings. To do so, right-click on the Windows Desktop, then click **Personalize** in Windows Vista and Windows 7 or **Properties** in Windows XP to change display settings. For more information, refer to the online documentation provided with the graphics controller utility or the documentation that came with your monitor.

# Launching Windows XP from Windows 7

Windows XP Mode for Windows 7 allows you to install and launch Windows XP applications from the Windows 7 taskbar. This feature is available on some computer models only.

To set up from a pre-installed Windows 7 desktop, click **Start** > **Windows Virtual PC** > **Virtual Windows XP** and follow the instructions on the screen.

# Accessing Disk Image (ISO) Files

There are disk image files (ISO files) included on your PC that contain the installation software for additional software. These CD image files are located in the folder C:\SWSetup\ISOs. Each .iso file can be burned to CD media to create an installation CD. It is recommended that these disks be

created and the software installed in order to get the most from your PC. The software and image file names are:

- Corel WinDVD SD and BD – installation software for WinDVD – used to play DVD movies
- HP Insight Diagnostics OR Vision Diagnostics – software to perform diagnostic activities on your PC

# 2 Computer Setup (F10) Utility

## Computer Setup (F10) Utilities

Use Computer Setup (F10) Utility to do the following:

- Change factory default settings.
- Set the system date and time.
- Set, view, change, or verify the system configuration, including settings for processor, graphics, memory, audio, storage, communications, and input devices.
- Modify the boot order of bootable devices such as hard drives, diskette drives, optical drives, or USB flash media devices.
- Enable Quick Boot, which is faster than Full Boot but does not run all of the diagnostic tests run during a Full Boot. You can set the system to:
  - ❑ always Quick Boot (default);
  - ❑ periodically Full Boot (from every 1 to 30 days); or
  - ❑ always Full Boot.
- Select Post Messages Enabled or Disabled to change the display status of Power-On Self-Test (POST) messages. Post Messages Disabled suppresses most POST messages, such as memory count, product name, and other non-error text messages. If a POST error occurs, the error is displayed regardless of the mode selected. To manually switch to Post Messages Enabled during POST, press any key (except F1 through F12).
- Establish an Ownership Tag, the text of which is displayed each time the system is turned on or restarted.
- Enter the Asset Tag or property identification number assigned by the company to this computer.
- Enable the power-on password prompt during system restarts (warm boots) as well as during power-on.
- Establish a setup password that controls access to the Computer Setup (F10) Utility and the settings described in this section.
- Secure integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable removable media boot ability.
- Enable or disable legacy diskette write ability (when supported by hardware).

- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).
- Replicate the system setup by saving system configuration information on diskette and restoring it on one or more computers.
- Execute self-tests on a specified ATA hard drive (when supported by drive).
- Enable or disable DriveLock security (when supported by drive).

## Using Computer Setup (F10) Utilities

Computer Setup can be accessed only by turning the computer on or restarting the system.
To access the Computer Setup Utilities menu, complete the following steps:

1. Turn on or restart the computer. If you are in Microsoft Windows, click **Start** > **Shut Down** > **Restart**.
2. As soon as the computer is turned on, press F10 when the monitor light turns green to enter Computer Setup. Press Enter to bypass the title screen, if necessary.

   **NOTE:** If you do not press F10 at the appropriate time, you must restart the computer and again press F10 when the monitor light turns green to access the utility.

3. Select your language from the list and press Enter.
4. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.
5. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, then press Enter. To return to the Computer Setup Utilities menu, press Esc.
6. To apply and save changes, select **File** > **Save Changes and Exit**.
   - If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
   - To reset to factory settings or previously saved default settings (some models), select **Apply Defaults and Exit**. This option will restore the original factory system defaults.

△ **CAUTION:** Do NOT turn the computer power OFF while the BIOS is saving the Computer Setup (F10) changes because the CMOS could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

**Table 2-1 Computer Setup (F10) Utility**

| Heading | Table |
|---|---|
| File | Computer Setup—File on page 6 |
| Storage | Computer Setup—Storage on page 7 |
| Security | Computer Setup—Security on page 9 |
| Power | Computer Setup—Power on page 14 |
| Advanced | Computer Setup—Advanced on page 15 |

# Computer Setup—File

**NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-2 Computer Setup—File**

| Option | Description |
|---|---|
| **System Information** | Lists:<br>• Product name<br>• SKU number (some models)<br>• Processor type/speed/stepping<br>• Cache size (L1/L2) (dual core processors have this listed twice)<br>• Installed memory size/speed, number of channels (single or dual) (if applicable)<br>• Integrated MAC address for embedded, enabled NIC (if applicable)<br>• System BIOS (includes family name and version)<br>• Chassis serial number<br>• Asset tracking number<br>• ME firmware version<br>• Management mode |
| **About** | Displays copyright notice. |
| **Set Time and Date** | Allows you to set system time and date. |
| **Flash System ROM** | Allows you to update the system ROM with a BIOS image file located on a USB flash media device or CD-ROM. |
| **Replicated Setup** | **Save to Removable Media**<br>Saves system configuration, including CMOS, to a formatted 1.44-MB diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive).<br>**Restore from Removable Media**<br>Restores system configuration from a diskette, a USB flash media device, or a diskette-like device. |
| **Default Setup** | **Save Current Settings as Default**<br>Saves the current system configuration settings as the default.<br>**Restore Factory Settings as Default**<br>Restores the factory system configuration settings as the default. |
| **Apply Defaults and Exit** | Applies the currently selected default settings and clears any established passwords. |
| **Ignore Changes and Exit** | Exits Computer Setup without applying or saving any changes. |
| **Save Changes and Exit** | Saves changes to system configuration or default settings and exits Computer Setup. |

# Computer Setup—Storage

**NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-3 Computer Setup—Storage**

| Option | Description |
|---|---|
| **Device Configuration** | Lists all installed BIOS-controlled storage devices.<br><br>When a device is selected, detailed information and options are displayed. The following options may be presented:<br><br>**CD-ROM**: No emulation options available.<br><br>**Hard Disk**: Size, model, serial number, connector color, SMART, emulation type.<br><br>• None (prevents BIOS data accesses and disables it as a boot device)<br><br>• Hard Disk (treated as a hard disk)<br><br>Translation Mode *(ATA disks only)*<br><br>Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.<br><br>**CAUTION:** Ordinarily, the translation mode selected automatically by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the disk was partitioned and formatted, the data on the disk will be inaccessible.<br><br>**Default Values** *(ATA disks only)*<br><br>**NOTE:** This feature appears only when User translation mode is selected.<br><br>Allows you to specify the parameters (logical cylinders, heads, and sectors per track) used by the BIOS to translate disk I/O requests (from the operating system or an application) into terms the hard drive can accept. Logical cylinders may not exceed 1024. The number of heads may not exceed 256. The number of sectors per track may not exceed 63. These fields are only visible and changeable when the drive translation mode is set to User.<br><br>**SATA Defaults**<br><br>**Translation Mode** *(ATA disks only)*<br><br>Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.<br><br>**CAUTION:** Ordinarily, the translation mode selected automatically by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the disk was partitioned and formatted, the data on the disk will be inaccessible. |

**Table 2-3 Computer Setup—Storage (continued)**

| | |
|---|---|
| **Storage Options** | **Removable Media Boot**<br><br>Enables/disables ability to boot the system from removable media.<br><br>**eSATA Port**<br><br>Allows you to set a SATA port as an eSATA port for use with an external drive.<br><br>**Max eSATA Speed**<br><br>Allows you to choose 1.5 Gbps or 3.0 Gpbs as the maximum eSATA speed. By default, the speed is limited to 1.5 Gbps for maximum reliability.<br><br>**CAUTION:** Consult your eSATA drive and cable manufacturer before enabling 3.0 Gpbs speed. Some drive and cable combinations may not run reliably at 3.0 Gpbs.<br><br>**NOTE:** eSATA is not available on USDT systems.<br><br>**SATA Emulation**<br><br>Allows you to choose how the SATA controller and devices are accessed by the operating system. There are three supported options: IDE, RAID, and AHCI.<br><br>IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode.<br><br>RAID - Allows DOS and boot access to RAID volumes. Use this mode with the RAID device driver loaded in the operating system to take advantage of RAID features.<br><br>AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.<br><br>**NOTE:** The RAID/AHCI device driver must be installed prior to attempting to boot from a RAID/AHCI volume. If you attempt to boot from a RAID/AHCI volume without the required device driver installed, the system will crash (blue screen). RAID volumes may become corrupted if they are booted to after disabling RAID. Refer to the *Advanced Host Controller Interface (AHCI) and Redundant Array of Independent Disks (RAID) on HP Compaq dc7900 Business PCs* white paper at http://www.hp.com for more information.<br><br>**NOTE:** RAID is not available on USDT systems. |
| **DPS Self-Test** | Allows you to execute self-tests on ATA hard drives capable of performing the Drive Protection System (DPS) self-tests.<br><br>**NOTE:** This selection will only appear when at least one drive capable of performing the DPS self-tests is attached to the system. |
| **Boot Order** | Allows you to:<br><br>• Specify the order in which attached devices (such as a USB flash media device, hard drive, optical drive, or network interface card) are checked for a bootable operating system image. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source.<br><br>• Specify the order of attached hard drives. The first hard drive in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached).<br><br>**NOTE:** MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.<br><br>**Shortcut to Temporarily Override Boot Order**<br><br>To boot **one time** from a device other than the default device specified in Boot Order, restart the computer and press F9 when the monitor light turns green. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press Enter. The computer then boots from the selected non-default device for this one time. |

# Computer Setup—Security

**NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-4 Computer Setup—Security**

| Option | Description |
|---|---|
| **Setup Password** | Allows you to set and enable a setup (administrator) password.<br><br>**NOTE:** If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.<br><br>See the *Desktop Management Guide* for more information. |
| **Power-On Password** | Allows you to set and enable a power-on password. The power-on password prompt appears after a power cycle. If the user does not enter the correct power-on password, the unit will not boot.<br><br>**NOTE:** This password does not appear on warm boots , such as Ctrl+Alt+Delete or **Restart from Windows**, unless enabled in **Password Options** (see below).<br><br>See the *Desktop Management Guide* for more information. |
| **Password Options**<br><br>(This selection appears only if a power-on password or setup password is set.) | Allows you to enable/disable:<br><br>• Lock Legacy Resources (appears if a setup password is set)<br>• Network Server Mode (appears if a power-on password is set)<br>• Password Prompt on Warm Boot (Ctrl+Alt+Delete) (appears if a power-on password is set)<br>• Setup Browse Mode (appears if a setup password is set) (allows viewing, but not changing, the F10 Setup Options without entering setup password)<br>• Stringent Password (appears if a power-on password is set), which when enabled bypasses the onboard password jumper to disable the power-on password.<br>• Password prompt on F9, F11, & F12 (allows access to menus without entering setup password)<br><br>See the *Desktop Management Guide* for more information. |
| **Smart Cover** (some models) | Allows you to:<br><br>• Lock/unlock the Cover Lock.<br>• Set the Cover Removal Sensor to Disable/Notify User/Setup Password.<br><br>**NOTE:** *Notify User* alerts the user that the sensor has detected that the cover has been removed. *Setup Password* requires that the setup password be entered to boot the computer if the sensor detects that the cover has been removed.<br><br>This feature is supported on some models only. See the *Desktop Management Guide* for more information. |

**Table 2-4 Computer Setup—Security (continued)**

| | |
|---|---|
| **Device Security** | Allows you to set Device Available/Device Hidden for:<br>• Serial ports<br>• Parallel port<br>• System audio<br>• Network controllers (some models)<br>• Embedded security device (some models)<br>• SATA0<br>• SATA1 (some models)<br>• SATA2 (some models)<br>• SATA3 (some models)<br>• eSATA (some models) |
| **USB Security** | Allows you to set Device Available/Device Hidden for:<br>• Front USB Ports<br>◦ USB Port 3<br>◦ USB Port 4<br>◦ USB Port 5<br>◦ USB Port 6<br>• Rear USB Ports<br>◦ USB Port 7<br>◦ USB Port 8<br>◦ USB Port 9<br>◦ USB Port 10<br>◦ USB Port 11<br>◦ USB Port 12<br>• Accessory USB Ports<br>◦ USB Port 1<br>◦ USB Port 2 |
| **Slot Security** | Allows you to disable any PCI or PCI Express slot |
| **Network Service Boot** | Enables/disables the computer's ability to boot from an operating system installed on a network server. (Feature available on NIC models only; the network controller must be either a PCI expansion card or embedded on the system board.) |

**Table 2-4 Computer Setup—Security (continued)**

| | |
|---|---|
| **System IDs** | Allows you to set:<br>• Asset tag (18-byte identifier), a property identification number assigned by the company to the computer.<br>• Ownership tag (80-byte identifier) displayed during POST.<br>• Chassis serial number or Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.)<br>• Keyboard locale setting (for example, English or German) for System ID entry. |
| **DriveLock Security** | Allows you to assign or modify a master or user password for hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.<br>**NOTE:** This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.<br>See the *Desktop Management Guide* for more information. |

**Table 2-4 Computer Setup—Security (continued)**

| | |
|---|---|
| **System Security** (some models: these options are hardware dependent) | Data Execution Prevention (some models) (enable/disable) - Helps prevent operating system security breaches.<br><br>PAVP (Models with Blu-ray drives) (disabled/min/max) - PAVP enables the Protected Audio Video Path in the Chipset. This may allow viewing of some protected high definition content that would otherwise be prohibited from playback. Selecting Max will assign 96 Megabytes of system memory exclusively to PAVP.<br><br>Virtualization Technology (some models) (enable/disable) - Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on.<br><br>Virtualization Technology Directed I/O (some models) (enable/disable) - Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on.<br><br>Trusted Execution Technology (some models) (enable/disable) - Controls the underlying processor and chipset features needed to support a virtual appliance. Changing this setting requires turning the computer off and then back on. To enable this feature you must enable the following features:<br><br>• Embedded Security Device Support<br><br>• Virtualization Technology<br><br>• Virtualization Technology Directed I/O<br><br>Embedded Security Device Support (some models) (enable/disable) - Permits activation and deactivation of the Embedded Security Device. Changing this setting requires turning the computer off and then back on.<br><br>**NOTE:** To configure the Embedded Security Device, a Setup password must be set.<br><br>• Reset to Factory Settings (some models) (Do not reset/Reset) - Resetting to factory defaults will erase all security keys. Changing this setting requires turning the computer off and then back on.<br><br>**CAUTION:** The embedded security device is a critical component of many security schemes. Erasing the security keys will prevent access to data protected by the Embedded Security Device. Choosing Reset to Factory Settings may result in significant data loss.<br><br>OS management of Embedded Security Device (some models) (enable/disable) - This option allows the user to limit operating system control of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. This option allows the user to limit OS control of the Embedded Security Device.<br><br>• Reset of Embedded Security Device through OS (some models) (enable/disable) - This option allows the user to limit the operating system ability to request a Reset to Factory Settings of the Embedded Security Device. Changing this setting requires turning the computer off and then back on.<br><br>**NOTE:** To enable this option, a Setup password must be set. |

**Table 2-4 Computer Setup—Security (continued)**

| | |
|---|---|
| **Master Boot Record Security** | Protects the master boot record from viruses or other corruption. Saves of copy of the current master boot record. |
| **Setup Security Level** | Provides a method to allow end-users limited access to change specified setup options, without having to know the Setup Password.<br><br>This feature allows the administrator the flexibility to protect changes to essential setup options, while allowing the user to view system settings and configure nonessential options. The administrator specifies access rights to individual setup options on a case-by-case basis via the Setup Security Level menu. By default, all setup options are assigned Setup Password, indicating the user must enter the correct Setup Password during POST to make changes to any of the options. The administrator may set individual items to None, indicating the user can make changes to the specified options when setup has been accessed with invalid passwords. The choice, None, is replaced by Power-On Password if a Power-On Password is enabled.<br><br>**NOTE:** Setup Browse Mode must be set to Enable in order for the user to enter Setup without knowing the setup password. |

# Computer Setup—Power

**NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-5 Computer Setup—Power**

| Option | Description |
|---|---|
| **OS Power Management** | • Runtime Power Management— Enable/Disable. Allows certain operating systems to reduce processor voltage and frequency when the current software load does not require the full capabilities of the processor.<br>• Idle Power Savings—Extended/Normal. Allows certain operating systems to decrease the processors power consumption when the processor is idle.<br>• ACPI S3 Hard Disk Reset—Enabling this causes the BIOS to ensure hard disks are ready to accept commands after resuming from S3 before returning control to the operating system.<br>• ACPI S3 PS2 Mouse Wakeup—Enables or disables waking from S3 due to any PS2 mouse activity or a button click only.<br>• USB Wake on Device Insertion (some models)—Allows system to wake from Standby on USB device insertion.<br>• Unique Sleep State Blink Rates—Enable/Disable. This feature is designed to provide a visual indication of what sleep state the system is in. Each sleep state has a unique blink pattern.<br>◦ S0 = Solid green LED.<br>◦ S3 = 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 3 blinks and a pause.<br>◦ S4 = 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 4 blinks and a pause.<br>◦ S5 = LED is off.<br>**NOTE:** If this feature is disabled, S4 and S5 both have the LED off. S1 (no longer supported) and S3 use 1 blink per second. |
| **Hardware Power Management** | SATA Power Management enables or disables SATA bus and/or device power management.<br>S5 Maximum Power Savings—Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 1 Watt power usage. |
| **Thermal** | Fan idle mode—This bar graph controls the minimum permitted fan speed.<br>**NOTE:** This setting only changes the minimum fan speed. The fans are still automatically controlled. |

# Computer Setup—Advanced

**NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-6 Computer Setup—Advanced (for advanced users)**

| Option | Heading |
|---|---|
| **Power-On Options** | Allows you to set:<br>• POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days).<br>◦ QuickBoot = Do not clear memory or perform a memory test.<br>◦ FullBoot = Memory test (count) on cold boot. Clears memory on all boots. |

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

| | |
|---|---|
| | ◦ Clear Memory = No memory count on cold boot. Clears memory on all boots.<br>◦ FullBoot Every x Days = Memory count on 1st cold boot on or after the xth day. No more memory counts until 1st cold boot on or after x days. Clears memory on all boots.<br>• POST messages (enable/disable).<br>• F9 prompt (hidden/displayed). Enabling this feature will display the text **F9 = Boot Menu** during POST. Disabling this feature prevents the text from being displayed. However, pressing F9 will still access the Shortcut Boot [Order] Menu screen. See **Storage** > **Boot Order** for more information.<br>• F10 prompt (hidden/displayed). Enabling this feature will display the text **F10 = Setup** during POST. Disabling this feature prevents the text from being displayed. However, pressing F10 will still access the Setup screen.<br>• F11 prompt (hidden/displayed). Setting this feature to displayed will display the text **F11 = Recovery** during POST. Hiding the feature prevents the text from being displayed. However, pressing F11 will still attempt to boot to the HP Backup and Recovery partition. See Factory Recovery Boot Support for more information.<br>• F12 prompt (hidden/displayed). Enabling this feature will display the text **F12 = Network** during POST. Disabling this feature prevents the text from being displayed. However, pressing F12 will still force the system to attempt booting from the network.<br>• Factory Recovery Boot Support (enable/disable). Enabling this feature will cause an additional prompt, **F11 = Recovery**, to be displayed during POST on systems with HP Backup and Recovery software installed and configured with a recovery partition on the boot hard drive. Pressing F11 causes the system to boot to the recovery partition and launch HP Backup and Recovery. The **F11 = Recovery** prompt can be hidden with the F11 prompt (hidden/displayed) option (see above).<br>• Option ROM Prompt (enable/disable). Enabling this feature will cause the system to display a message before loading option ROMs. (This feature is supported on some models only.)<br>• Remote Wakeup Boot Source (remote server/local hard drive).<br>• After Power Loss (off/on/previous state): Setting this option to:<br>◦ Off—causes the computer to remain powered off when power is restored.<br>◦ On—causes the computer to power on automatically as soon as power is restored.<br>◦ Previous state—causes the computer to power on automatically as soon as power is restored, if it was on when power was lost.<br>**NOTE:** If you turn off power to the computer using the switch on a power strip, you will not be able to use the suspend/sleep feature or the Remote Management features.<br>• POST Delay (None, 5, 10 15, or 20 seconds). Enabling this feature will add a user-specified delay to the POST process. This delay is sometimes needed for hard disks on some PCI cards that spin up very slowly, so slowly that they are not ready to boot by the time POST is finished. The POST delay also gives you more time to select F10 to enter Computer (F10) Setup.<br>• Bypass F1 Prompt on Configuration Changes (Enable/Disable). Allows you to set the computer not to confirm when changes were made. |
| **Execute Memory Test** (some models) | Restarts the computer and executes the POST memory test/logging. |
| **BIOS Power-On** | Allows you to set the computer to turn on automatically at a time you specify. |
| **Onboard Devices** | Allows you to set resources for or disable onboard system devices (diskette controller, serial port, or parallel port). |

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

| | |
|---|---|
| **PCI Devices** | • Lists currently installed PCI devices and their IRQ settings.<br>• Allows you to reconfigure IRQ settings for these devices or to disable them entirely. These settings have no effect under an ACPI-based operating system. |
| **PCI VGA Configuration** | Displayed only if there are multiple PCI video adapters in the system. Allows you to specify which VGA controller will be the “boot” or primary VGA controller.<br>**NOTE:** In order to see this entry, you must enable Integrated Video (**Advanced** > **Device Options**) and Save Changes and Exit. |
| **Bus Options** | On some models, allows you to enable or disable:<br>• PCI SERR# Generation.<br>• PCI VGA Palette Snooping, which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed. |
| **Device Options** | Allows you to set:<br>• Printer mode (Bi-Directional, EPP + ECP, Output Only).<br>• Num Lock State at Power-On (off/on).<br>• S5 Wake on LAN (enable/disable).<br>◦ To disable Wake on LAN during the off state (S5), use the arrow (left and right) keys to select the **Advanced** > **Device Options** menu and set the **S5 Wake on LAN** feature to **Disable**. This obtains the lowest power consumption available on the computer during S5. It does not affect the ability of the computer to Wake on LAN from suspend or hibernation, but will prevent it from waking from S5 via the network. It does not affect operation of the network connection while the computer is on.<br>◦ If a network connection is not required, completely disable the network controller (NIC) by using the arrow (left and right) keys to select the **Security** > **Device Security** menu. Set the **Network Controller** option to **Device Hidden**. This prevents the network controller from being used by the operating system and reduces the power used by the computer in S5.<br>• Multi-Processor (enable/disable). This option may be used to disable multi-processor support under the OS.<br>• Internal Speaker (some models) (does not affect external speakers).<br>• NIC PXE Option ROM Download (enable/disable). The BIOS contains an embedded NIC option ROM to allow the unit to boot through the network to a PXE server. This is typically used to download a corporate image to a hard drive. The NIC option ROM takes up memory space below 1MB commonly referred to as DOS Compatibility Hole (DCH) space. This space is limited. This F10 option will allow users to disable the downloading of this embedded NIC option ROM thus giving more DCH space for additional PCI cards which may need option ROM space. The default will be to have the NIC option-ROM-enabled. |

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

| | |
|---|---|
| **Management Devices** | The Management Devices menu will only be displayed in the Advanced menu when the BIOS detects multiple management options.<br><br>This option is for installed NIC cards that support ASF or DASH. Use the Management Devices menu to select if the BIOS management operations will be through the embedded solution or one of the installed NIC cards. |
| **Management Operations** | Allows you to set:<br><br>• MEBx Setup Prompt (enable/disable). Enabling this feature displays the **CTRL+P** prompt during POST. Disabling this feature prevents the prompt from being displayed. However, pressing Ctrl+P still accesses the utility used to configure manageability settings.<br><br>The **CTRL+P** function activates the MEBx Setup menu. If the Setup Password is configured, the user will be prompted to correctly enter it before being allowed to enter the MEBx Setup. It the password is entered incorrectly three times, the MEBx Setup will not be activated.<br><br>• Intel Remote PC Assist Prompt (Hidden/Displayed). Displaying this feature displays the **CTRL+ALT+F1** prompt during POST. Hiding this feature prevents the prompt from being displayed. However, pressing Ctrl+Alt+F1 still accesses the utility used to attempt to connect to remote help server or services.<br><br>• Intel PC Assist Timeout (5, 10, 15, 20, 30, 40, 50, 60, 120, 180, 240 seconds). Allows the user/administrator is set a time limit for Remote Help to establish contact with a remote server when initiated.<br><br>• SOL Terminal Emulation Mode. Selects between VT100 and ANSI SOL terminal emulation. SOL terminal emulation mode is only activated during remote AMT redirection operations. The emulation options allow administrators to select which mode works best with their console.<br><br>• SOL Local Keyboard (enable/disable). Disable or enable client keyboard during SOL sessions. Some remote remediation may involve having the local client boot a remote image provided by an administrator. This option determines if the BIOS will keep the local keyboard enabled or disabled for possible local client interaction. If the local keyboard is disabled, all keyboard input is only accepted from the remote source.<br><br>• Unprovision AMT on next boot. Allows reset of AMT settings. |

# Recovering the Configuration Settings

This method of recovery requires that you first perform the **Save to Removable Media** command with the Computer Setup (F10) Utility before **Restore** is needed. (See Save to Removable Media on page 6 in the Computer Setup—File table.)

**NOTE:** It is recommended that you save any modified computer configuration settings to a diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive) and save the diskette or device for possible future use.

To restore the configuration, insert the diskette, USB flash media device, or other storage media emulating a diskette with the saved configuration and perform the **Restore from Removable Media** command with the Computer Setup (F10) Utility. (See Restore from Removable Media on page 6 in the Computer Setup—File table.)

# 3 Serial ATA (SATA) Drive Guidelines and Features

**NOTE:** HP only supports the use of SATA hard drives on these models of computer. No Parallel ATA (PATA) drives are supported.

## SATA Hard Drives

| Serial ATA Hard Drive Characteristics | |
|---|---|
| Number of pins/conductors in data cable | 7/7 |
| Number of pins in power cable | 15 |
| Maximum data cable length | 39.37 in (100 cm) |
| Data interface voltage differential | 400-700 mV |
| Drive voltages | 3.3 V, 5 V, 12 V |
| Jumpers for configuring drive | N/A |
| Data transfer rate | 3.0 Gb/s |

## SATA Hard Drive Cables

### SATA Data Cable

Always use an HP approved SATA 3.0 Gb/s cable as it is fully backwards compatible with the SATA 1.5 Gb/s drives.

Current HP desktop products ship with SATA 3.0 Gb/s hard drives.

SATA data cables are susceptible to damage if overflexed. Never crease a SATA data cable and never bend it tighter than a 30 mm (1.18 in) radius.

The SATA data cable is a thin, 7-pin cable designed to transmit data for only a single drive.

# SMART ATA Drives

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for the HP Personal Computers have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive. The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

# Hard Drive Capacities

The combination of the file system and the operating system used in the computer determines the maximum usable size of a drive partition. A drive partition is the largest segment of a drive that may be properly accessed by the operating system. A single hard drive may therefore be subdivided into a number of unique drive partitions in order to make use of all of its space.

Because of the differences in the way that drive sizes are calculated, the size reported by the operating system may differ from that marked on the hard drive or listed in the computer specification. Drive size calculations by drive manufacturers are bytes to the base 10 while calculations by Microsoft are bytes to the base 2.

**Drive/Partition Capacity Limits**

| | | | Maximum Size | |
|---|---|---|---|---|
| **File System** | **Controller Type** | **Operating System** | **Partition** | **Drive** |
| FAT 32 | ATA | Windows XP/Windows Vista/Windows 7 | 32 GB | 2 TB |
| NTFS | ATA | Windows XP/Windows Vista/Windows 7 | 2 TB | 2 TB |

# 4 Identifying the Chassis, Routine Care, and Disassembly Preparation

This chapter provides general service information for the computer. Adherence to the procedures and precautions described in this chapter is essential for proper service.

△ **CAUTION:** When the computer is plugged into an AC power source, voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

## Chassis Designations

Front bezel appearance varies by model.

### Convertible Minitower (CMT)

#### 8000 Models

**Figure 4-1** Convertible Minitower – 8000 Models

## 8080 Models

**Figure 4-2** Convertible Minitower – 8080 Models

# Small Form Factor (SFF)

**Figure 4-3** Small Form Factor chassis

## Ultra-Slim Desktop (USDT)

**Figure 4-4** Ultra-Slim Desktop chassis

# Electrostatic Discharge Information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.

## Generating Static

The following table shows that:

- Different activities generate different amounts of static electricity.
- Static electricity increases as humidity decreases.

| | Relative Humidity | | |
|---|---|---|---|
| **Event** | **55%** | **40%** | **10%** |
| Walking across carpet | 7,500 V | 15,000 V | 35,000 V |
| Walking across vinyl floor | 3,000 V | 5,000 V | 12,000 V |
| Motions of bench worker | 400 V | 800 V | 6,000 V |
| Removing DIPs from plastic tube | 400 V | 700 V | 2,000 V |
| Removing DIPs from vinyl tray | 2,000 V | 4,000 V | 11,500 V |
| Removing DIPs from Styrofoam | 3,500 V | 5,000 V | 14,500 V |
| Removing bubble pack from PCB | 7,000 V | 20,000 V | 26,500 V |
| Packing PCBs in foam-lined box | 5,000 V | 11,000 V | 21,000 V |
| These are then multi-packaged inside plastic tubes, trays, or Styrofoam. | | | |

**NOTE:** 700 volts can degrade a product.

## Preventing Electrostatic Damage to Equipment

Many electronic components are sensitive to ESD. Circuitry design and structure determine the degree of sensitivity. The following packaging and grounding precautions are necessary to prevent damage to electric components and accessories.

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from their container.

- Always be properly grounded when touching a sensitive component or assembly.
- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

## Personal Grounding Methods and Equipment

Use the following equipment to prevent static electricity damage to equipment:

- **Wrist straps** are flexible straps with a maximum of one-megohm ± 10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm ± 10% resistance between the operator and ground.

**Static Shielding Protection Levels**

| Method | Voltage |
|---|---|
| Antistatic plastic | 1,500 |
| Carbon-loaded plastic | 7,500 |
| Metallized laminate | 15,000 |

## Grounding the Work Area

To prevent static damage at the work area, use the following precautions:

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Use static-dissipative mats, foot straps, or air ionizers to give added protection.
- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.
- Turn off power and input signals before inserting and removing connectors or test equipment.
- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

## Recommended Materials and Equipment

Materials and equipment that are recommended for use in preventing static electricity include:

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors

- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one-megohm +/- 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

# Operating Guidelines

To prevent overheating and to help prolong the life of the computer:

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.
- Keep liquids away from the computer and keyboard.

- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including sleep states.

# Routine Care

## General Cleaning Safety Precautions

1. Never use solvents or flammable solutions to clean the computer.
2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
3. Always unplug the computer when cleaning with liquids or damp cloths.
4. Always unplug the computer before cleaning the keyboard, mouse, or air vents.
5. Disconnect the keyboard before cleaning it.
6. Wear safety glasses equipped with side shields when cleaning the keyboard.

## Cleaning the Computer Case

Follow all safety precautions in General Cleaning Safety Precautions on page 27 before cleaning the computer.

To clean the computer case, follow the procedures described below:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed as the alcohol will evaporate quickly and not leave a residue.
- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the computer. Lint and other foreign matter can block the vents and limit the airflow.

## Cleaning the Keyboard

Follow all safety precautions in General Cleaning Safety Precautions on page 27 before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in Cleaning the Computer Case on page 27.

When cleaning debris from under the keys, review all rules in General Cleaning Safety Precautions on page 27 before following these procedures:

△ **CAUTION:** Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.
- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.

  △ **CAUTION:** Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard may not function properly.

- Cleaning under a key may be done with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

## Cleaning the Monitor

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in Cleaning the Computer Case on page 27.

## Cleaning the Mouse

Before cleaning the mouse, ensure that the power to the computer is turned off.

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in Cleaning the Computer Case on page 27.

# Service Considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the computer.

## Power Supply Fan

The power supply fan is a variable-speed fan based on the temperature in the power supply.

△ **CAUTION:** The cooling fan is always on when the computer is in the “On” mode. The cooling fan is off when the computer is in “Standby,” “Suspend,” or “Off” modes.

You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

## Tools and Software Requirements

To service the computer, you need the following:

- Torx T-15 screwdriver (HP screwdriver with bits, PN 161946-001)
- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)
- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)
- Phillips #2 screwdriver
- Diagnostics software
- HP tamper-resistant T-15 wrench (Smart Cover FailSafe Key, PN 166527-001) or HP tamper-resistant bits (Smart Cover FailSafe Key, PN 166527-002)

## Screws

The screws used in the computer are not interchangeable. They may have standard or metric threads and may be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the part that was removed, then returned to their proper locations.

△ **CAUTION:** Metric screws have a black finish. U.S. screws have a silver finish and are used on hard drives only.

**CAUTION:** As each subassembly is removed from the computer, it should be placed away from the work area to prevent damage.

## Cables and Connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

△ **CAUTION:** When servicing this computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

## Hard Drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package “Fragile: Handle With Care.”
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the CPU.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.

- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to Electrostatic Discharge Information on page 24
- Do not use excessive force when inserting a drive.
- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

## Lithium Coin Cell Battery

The battery that comes with the computer provides power to the real-time clock and has a minimum lifetime of about three years.

See the appropriate removal and replacement chapter for the chassis you are working on in this guide for instructions on the replacement procedures.

⚠ **WARNING!** This computer contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose in water or fire, or expose it to temperatures higher than 140ºF (60ºC). Do not attempt to recharge the battery.

**NOTE:** Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, their authorized partners, or their agents.

# 5 Removal and Replacement Procedures Convertible Minitower (CMT) Chassis

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

**NOTE:** Not all features listed in this guide are available on all computers.

## Preparation for Disassembly

See Identifying the Chassis, Routine Care, and Disassembly Preparation on page 21 for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer (External Security Devices on page 77).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any diskette, compact disc, or media card from the computer.
5. Turn off the computer and any peripheral devices that are connected to it.

   **CAUTION:** Turn off the computer before disconnecting any cables.

   Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the “Standby,” or “Suspend” modes. The power cord should always be disconnected before servicing a unit.
6. Disconnect the power cord from the electrical outlet and then from the computer.
7. Disconnect all peripheral device cables from the computer.
8. As applicable, lay the computer down on its side to achieve a safe working position.

   **NOTE:** During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

**CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

# Unlocking the Smart Cover Lock

**NOTE:** The Smart Cover Lock is an optional feature included on some models only.

The Smart Cover Lock is a software-controllable cover lock, controlled by the setup password. This lock prevents unauthorized access to the internal components. The computer ships with the Smart Cover Lock in the unlocked position. For more information about locking the Smart Cover Lock, refer to the *Desktop Management Guide*.

## Smart Cover FailSafe Key

If you enable the Smart Cover Lock and cannot enter your password to disable the lock, you will need a Smart Cover FailSafe Key to open the computer cover. You will need the key to access the internal computer components in any of the following circumstances:

- Power outage
- Startup failure
- PC component (for example, processor or power supply) failure
- Forgotten password

**NOTE:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need it.

To obtain a FailSafe Key:

- Contact an authorized HP reseller or service provider. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.
- Refer to the HP Web site (http://www.hp.com) for ordering information.
- Call the appropriate number listed in the warranty or in the *Support Telephone Numbers* guide.

## Using the Smart Cover FailSafe Key to Remove the Smart Cover Lock

To open the access panel with the Smart Cover Lock engaged:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

**CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Use the Smart Cover FailSafe Key to remove the two tamper-proof screws that secure the Smart Cover Lock to the chassis.

**Figure 5-1** Removing the Smart Cover Lock Screws

You can now remove the access panel. See Computer Access Panel on page 150.

To reattach the Smart Cover Lock, secure the lock in place with the tamper-proof screws.

# Computer Access Panel

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31)
2. Lay the computer down on its large base for greater stability.
3. Lift up on the access panel handle **(1)** then lift the access panel off the computer **(2)**.

**Figure 5-2** Removing the Computer Access Panel

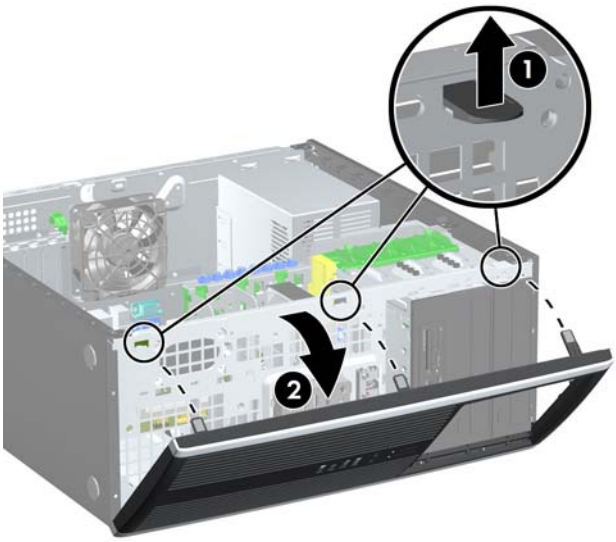

To install the access panel, reverse the removal procedure.

# Front Bezel

Front bezel appearance varies by model.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Lift up the three tabs on the side of the bezel **(1)**, then rotate the bezel off the chassis **(2)**.

**Figure 5-3** Removing the Front Bezel



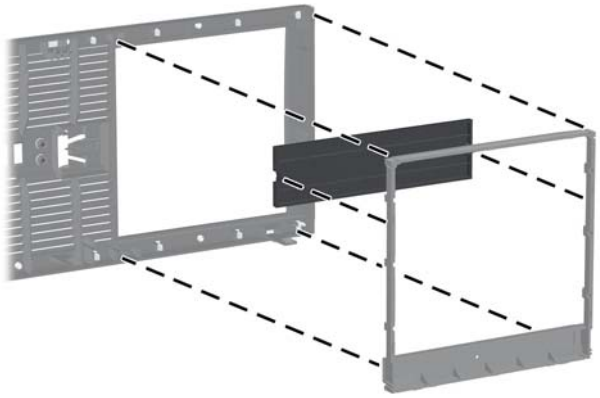

To install the front bezel, reverse the removal procedure.

# Bezel Blanks

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the front bezel (Front Bezel on page 35).
4. Gently pull the subpanel, with the bezel blanks secured in it, away from the front bezel, then remove the desired bezel blank.

△ **CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.

**Figure 5-4** Removing Bezel Blanks from the Subpanel (Desktop Shown)



**NOTE:** When replacing the subpanel, ensure that the aligning pins and any remaining bezel blanks are in their proper orientation. The logo on the subpanel should be located at the bottom of the subpanel when properly oriented.

# Cable Management

Always follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.
- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.
- Keep cables clear of sliding or moveable parts to prevent them from being cut or crimped when the parts are moved.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come prefolded. Never change the folds on these cables.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.
- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

When removing the power supply power cables from the connectors on the system board, always follow these steps:

1. Squeeze on the top of the retaining latch attached to the cable end of the connector **(1)**.
2. Grasp the cable end of the connector and pull it straight up **(2)**.

△ **CAUTION:** Always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.

**Figure 5-5** 6-pin power connector

## Cable Connections

System board connectors are color-coded to make it easier to find the proper connection.

System Board Connections

| System Board Connector | Connector Color | Description |
|---|---|---|
| PWR | White | Power supply, 6-pin |
| PWRCPU | White | Power supply, 4-pin |
| CHFAN2 | Brown | Rear chassis fan |
| SATAPWR0 | Black | ODD power connector |
| SATAPWR1 | Black | HDD power connector |
| PB/LED | Black | Front power button/LED |
| FRNT USB | Yellow | Front I/O USB cable |
| FRNT USB2 | Green | Front I/O USB cable |
| FRONT AUD | Blue | Front audio |
| SPRK | White | Internal speaker |
| COMB | Black | Serial port |
| HLOCK | Black | Hood lock solenoid |
| HSENSE | White | Hood sensor |
| MEDIA | Black | Media card reader |
| PAR | Black | Flying parallel port header |

# Installing Additional Memory

The computer comes with double data rate 2 synchronous dynamic random access memory (DDR2-SDRAM) dual inline memory modules (DIMMs).

## DIMMs

The memory sockets on the system board can be populated with up to four industry-standard DIMMs. These memory sockets are populated with at least one preinstalled DIMM. To achieve the maximum memory support, you can populate the system board with up to 16-GB of memory configured in a high-performing dual channel mode.

## DDR3-SDRAM DIMMs

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-8500 DDR3-1066 MHz-compliant or PC3-10600 DDR3-1333 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 7 DDR3 1066 MHz (7-7-7 timing) and CAS latency 9 DDR3 1333 MHz (9-9-9 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

**NOTE:** The system will not operate properly if you install unsupported DIMMs.

## Populating DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled XMM1, XMM2, XMM3, and XMM4. Sockets XMM1 and XMM2 operate in memory channel A. Sockets XMM3 and XMM4 operate in memory channel B.

**Figure 5-6** DIMM Socket Locations

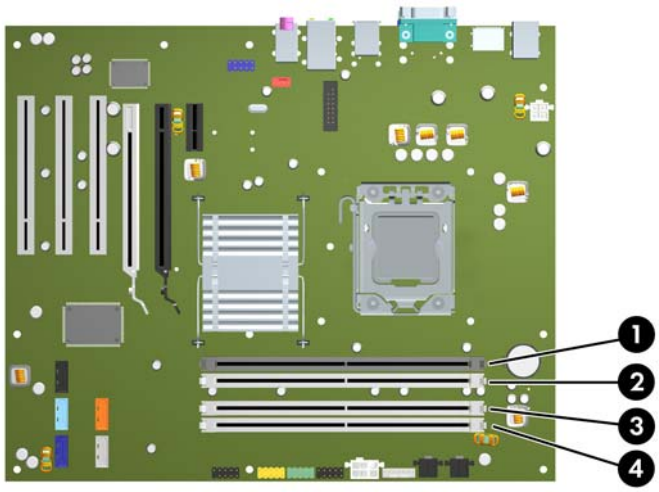



**Table 5-1 DIMM Socket Locations**

| Item | Description | Socket Color |
|---|---|---|
| 1 | XMM1 socket, Channel A (populate first) | Black |
| 2 | XMM2 socket, Channel A (populate third) | White |
| 3 | XMM3 socket, Channel B (populate second) | White |
| 4 | XMM4 socket, Channel B (populate fourth) | White |

**NOTE:** A DIMM must occupy the black XMM1 socket. Otherwise, the system will display a POST error message indicating that a memory module must be installed in the wrong socket.

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the DIMMs are installed.

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with two 1-GB DIMMs and Channel B is populated with one 2-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to

Channel A. For example, if you are populating the sockets with one 2-GB DIMM, and three 1-GB DIMMs, Channel A should be populated with the 2-GB DIMM and one 1-GB DIMM, and Channel B should be populated with the other two 1-GB DIMMs. With this configuration, 4-GB will run as dual channel and 1-GB will run as single channel.

- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

△ **CAUTION:** You must disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

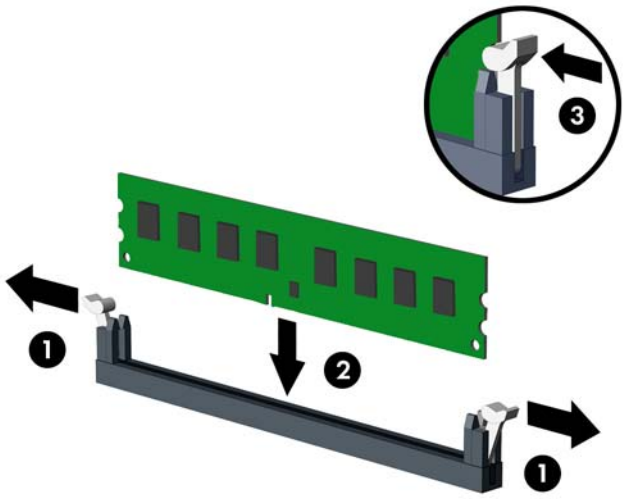
When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Locate the memory module sockets on the system board.

⚠ **WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

4. Open both latches of the memory module socket **(1)**, and insert the memory module into the socket **(2)**.

**Figure 5-7** Installing a DIMM




**NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

A DIMM must occupy the black XMM1 socket.

Populate the DIMM sockets in the following order: XMM1, XMM3, XMM2, then XMM4.

For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B.

5. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position **(3)**.
6. Repeat steps 4 and 5 to install any additional modules.
7. Replace the computer access panel.
8. Reconnect the power cord and turn on the computer.
9. Lock any security devices that were disengaged when the computer access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

# Expansion Cards

The computer has three standard full-height PCI expansion slots, one PCI Express x1 expansion slot, one PCI Express x16 expansion slot, and one PCI Express x16 expansion slot that is downshifted to a x4 slot.

**Figure 5-8** Expansion Slot Locations

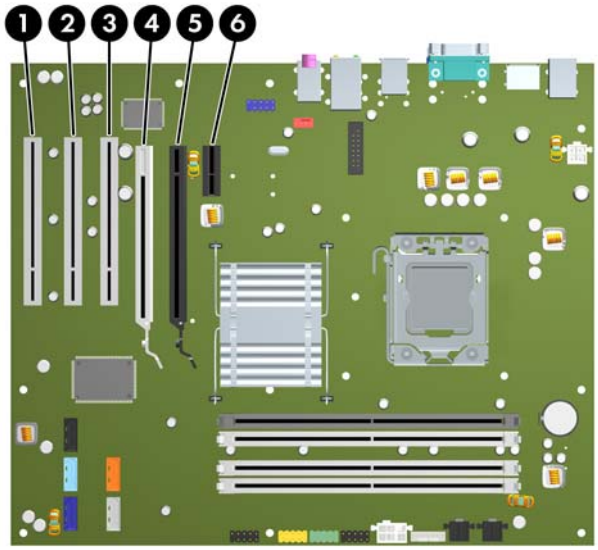



**Table 5-2 Expansion Slot Locations**

| Item | Description |
|---|---|
| 1 | PCI expansion slot |
| 2 | PCI expansion slot |
| 3 | PCI expansion slot |
| 4 | PCI Express x16 expansion slot that is downshifted to a x4 slot |
| 5 | PCI Express x16 expansion slot |
| 6 | PCI Express x1 expansion slot |

**NOTE:** You can install a PCI Express x1, x8, or x16 expansion card in the PCI Express x16 slots.

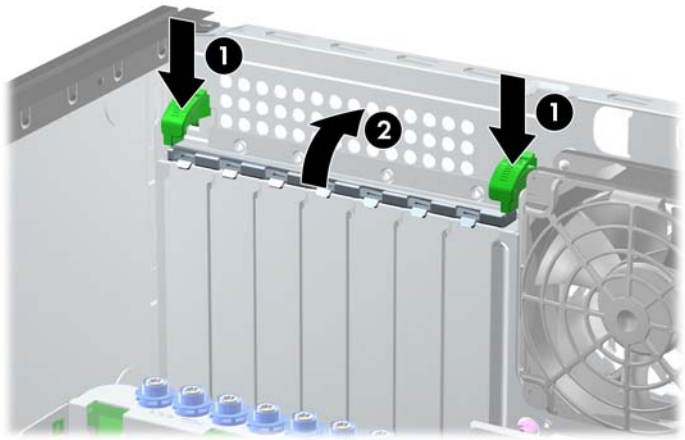
For dual graphics card configurations, the first (primary) card must be installed in the PCI Express x16 slot that is NOT downshifted to a x4 slot.

To remove, replace, or add an expansion card:

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.

4. Press straight down on the two green thumb tabs inside the chassis **(1)** and rotate the expansion card retention latch up **(2)**.

**Figure 5-9** Opening the Expansion Slot Retainer

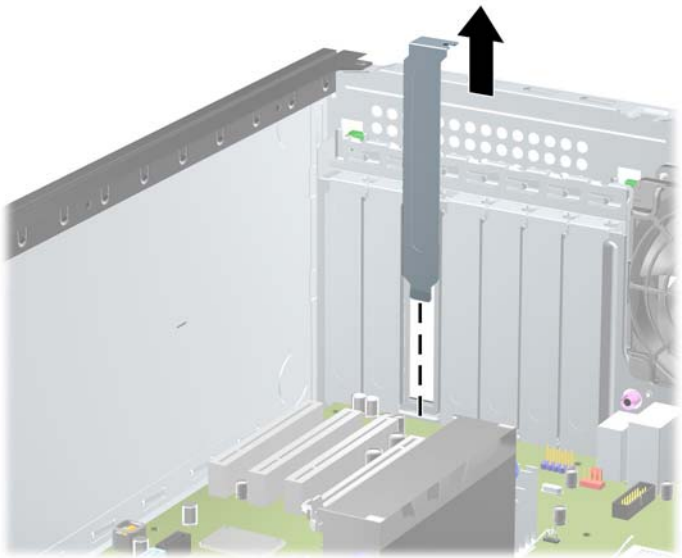



5. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

**NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Lift the expansion slot cover from the expansion slot.

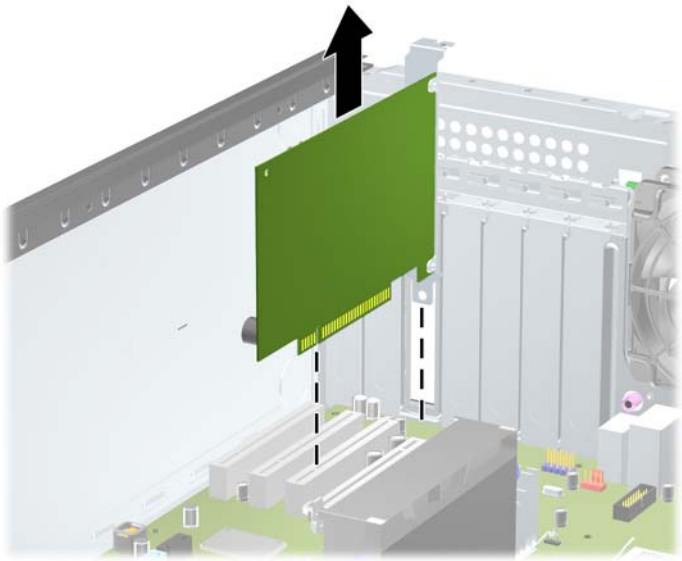
**Figure 5-10** Removing an Expansion Slot Cover



**b.** If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.

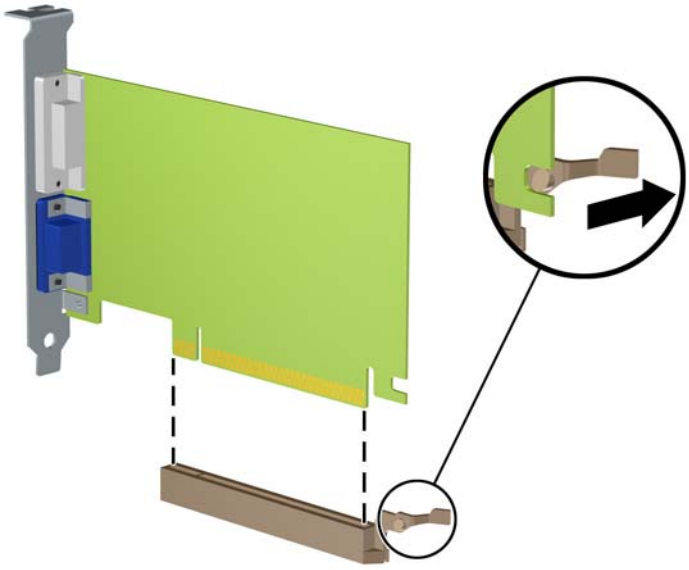
**NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

**Figure 5-11** Removing a Standard PCI Expansion Card



**c.** If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Lift the card straight up to remove it. Be sure not to scrape the card against other components.

**Figure 5-12** Removing a PCI Express x16 Expansion Card



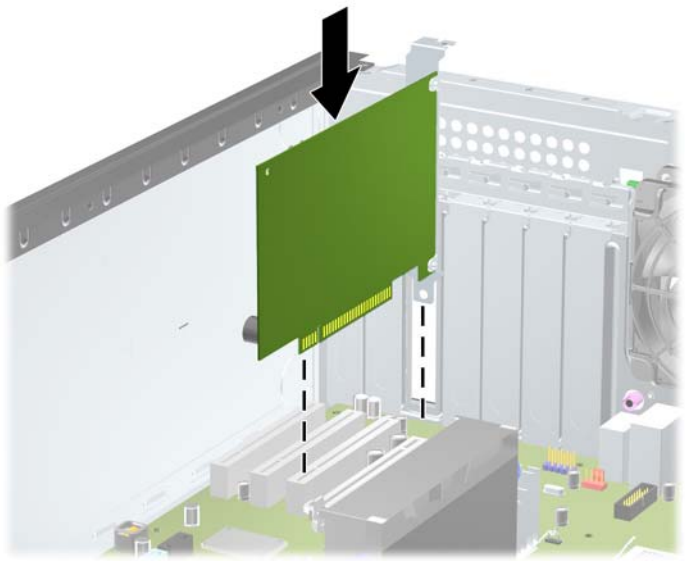
6. Store the removed card in anti-static packaging.

7. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

△ **CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

8. To install a new expansion card, slide the bracket on the end of the card down into the slot on the back of the chassis and press the card down firmly into the socket on the system board.

**Figure 5-13** Installing an Expansion Card



**NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

9. Close the expansion card retention latch, making sure that it snaps firmly into place.

10. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.

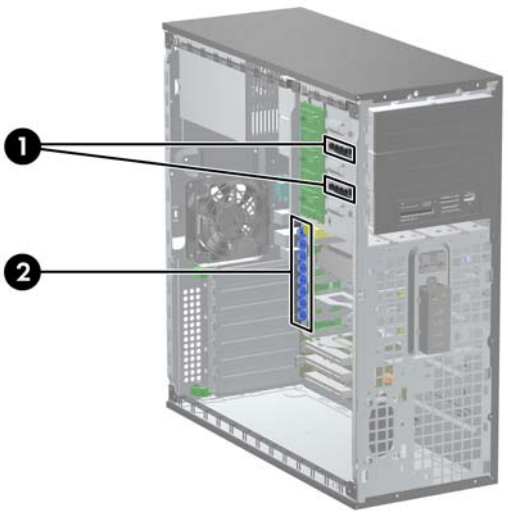
11. Reconfigure the computer, if necessary. Refer to Computer Setup (F10) Utility on page 4 for instructions on using Computer Setup.

# Drives

When installing additional drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue SATA connector on the system board labeled SATA0.
- Connect the first SATA optical drive to the white SATA connector on the system board labeled SATA1.
- Connect devices in order of SATA0, SATA1, SATA2, then SATA3.
- Connect an optional eSATA adapter cable to the black ESATA connector on the system board.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA. If the media card reader has a 1394 port, connect the 1394 cable to the 1394 PCI card.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You may install either a third-height or a half-height drive into a half-height bay.
- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws installed on the chassis. The hard drive uses 6-32 isolation mounting guide screws, eight of which are installed on the hard drive bracket under the access panel. All other drives use M3 metric screws, eight of which are installed on the optical drive bracket under the access panel. The HP-supplied metric guide screws are black. The HP-supplied 6-32 isolation mounting guide screws are silver and blue. If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting guide screws from the old hard drive and install them in the new hard drive.

**Figure 5-14** Extra Guide Screw Locations




| No. | Guide Screw | Device |
|---|---|---|
| 1 | Black M3 Metric Screws | 5.25-inch Drives |
| 2 | Silver and Blue 6-32 Isolation Mounting Screws | 3.5-inch Hard Drives |

△ **CAUTION:** To prevent loss of work and damage to the computer or drive:

If you are inserting or removing a drive, shut down the operating system properly, turn off the computer, and unplug the power cord. Do not remove a drive while the computer is on or in standby mode.

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.

Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

If a drive must be mailed, place the drive in a bubble-pack mailer or other protective packaging and label the package “Fragile: Handle With Care.”

## System Board Drive Connections

Refer to the following illustration and table to identify the system board drive connectors.

**Figure 5-15** System Board Drive Connections

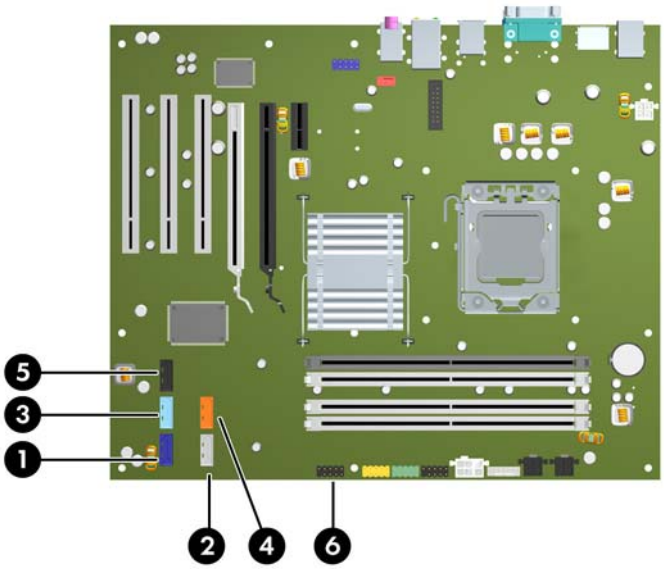



**Table 5-3 System Board Drive Connections**

| No. | System Board Connector | System Board Label | Color |
|---|---|---|---|
| 1 | SATA0 | SATA0 | dark blue |
| 2 | SATA1 | SATA1 | white |
| 3 | SATA2 | SATA2 | light blue |
| 4 | SATA3 | SATA3 | orange |
| 5 | eSATA | ESATA | black |
| 6 | Media Card Reader | MEDIA | black |

# Drive Positions

**Figure 5-16** Desktop and Minitower Drive Positions

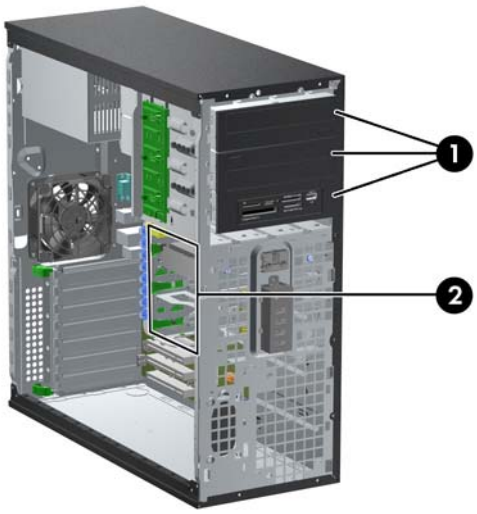



**Table 5-4 Drive Positions**

| | |
|---|---|
| 1 | Three 5.25-inch external drive bays for optional drives (optical drives and media card reader shown) |
| 2 | Three 3.5-inch internal hard drive bays |
| **NOTE:** | The drive configuration on your computer may be different than the drive configuration shown above. |

The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

To verify the type and size of the storage devices installed in the computer, run Computer Setup.

## Removing a Drive from a Drive Bay

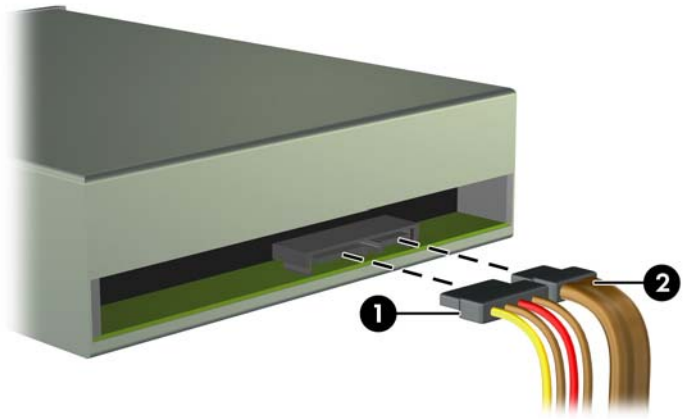
△ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Disconnect the drive cables, as indicated in the following illustrations:

△ **CAUTION:** When removing the cables, pull the tab or connector instead of the cable itself to avoid damaging the cable.

- If you are removing an optical drive, disconnect the power cable **(1)** and data cable **(2)** from the back of the drive.

**Figure 5-17** Disconnecting the Optical Drive Cables



- If you are removing a media card reader, disconnect the USB cable from the system board. If the media card reader has a 1394 port, disconnect the 1394 cable from the PCI card.

**Figure 5-18** Disconnecting the Media Card Reader USB Cable

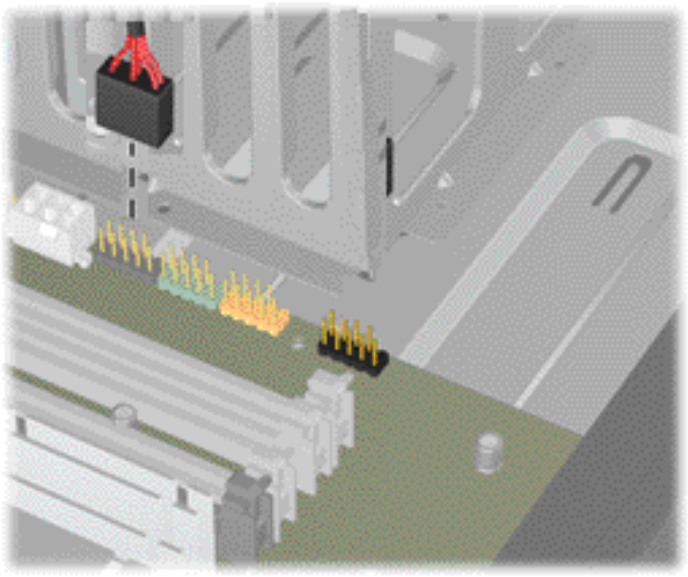
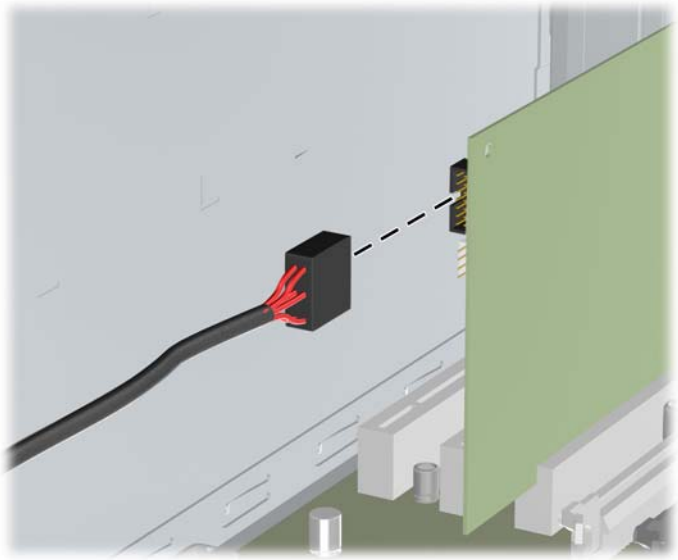


**Figure 5-19** Disconnecting the Media Card Reader 1394 Cable

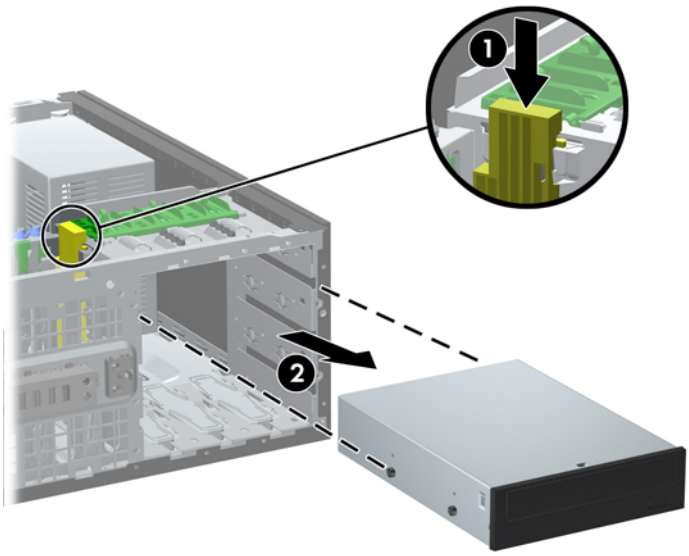


4. Remove the drive from the drive bay as follows:

   - To remove a 5.25-inch drive in the desktop configuration, press down on the yellow drivelock mechanism **(1)** and slide the drive from the drive bay **(2)**.

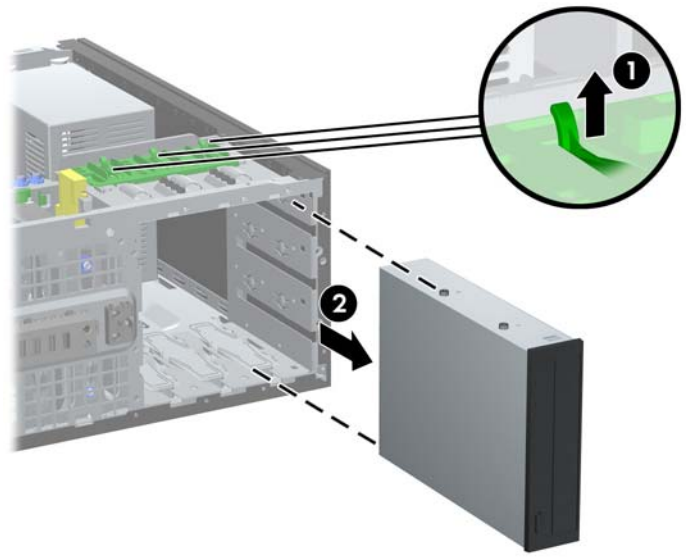
     △ **CAUTION:** When the yellow drivelock is pressed, all the external 5.25-inch drives are released so do not tilt the unit and allow the drives to fall out.

     **Figure 5-20** Removing a 5.25-inch Drive in the Desktop Configuration (Optical Drive shown)

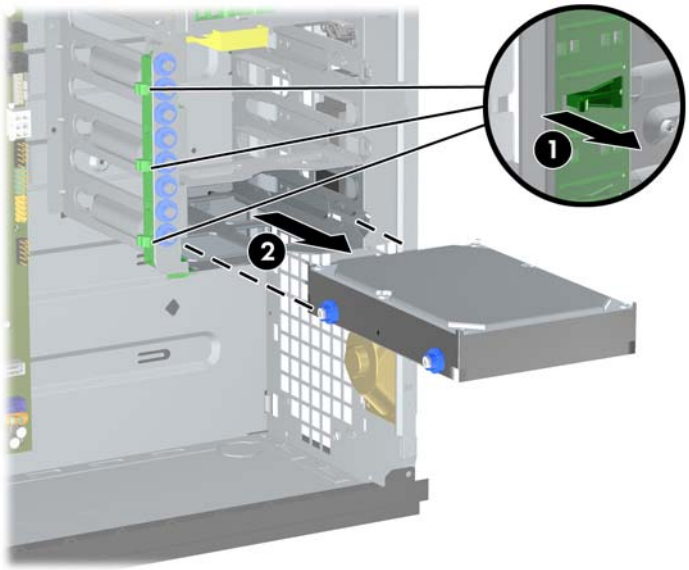
   - To remove a 5.25-inch drive in the minitower configuration, pull up on the green drivelock mechanism **(1)** for that specific drive and slide the drive from the drive bay **(2)**.

     **Figure 5-21** Removing a 5.25-inch Drive in the Minitower Configuration (Optical Drive shown)

- To remove a hard drive from and internal 3.5-inch drive bay, pull up on the green hard drive drivelock mechanism **(1)** for that drive and slide the drive from the drive bay **(2)**.

**Figure 5-22** Removing a Hard Drive




5. Store the removed drive in anti-static packaging.

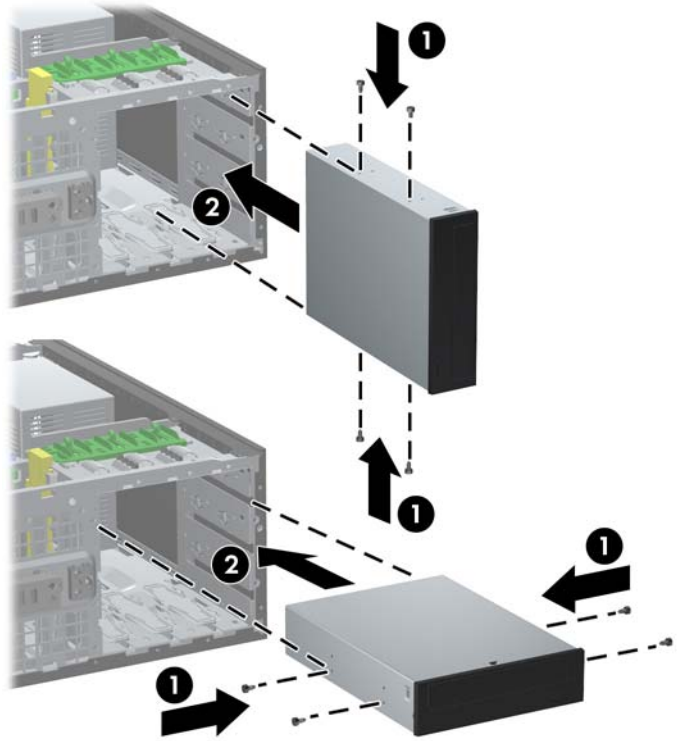
## Installing a 5.25-inch Drive into an External Drive Bay

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the front bezel (Front Bezel on page 35). If you are installing a drive in a bay covered by a bezel blank, remove the bezel blank. See Bezel Blanks on page 36 for more information.
4. Install four M3 metric guide screws in the lower holes on each side of the drive **(1)**. HP has provided four extra M3 metric guide screws on the 5.25-inch drive bracket under the access panel. The M3 metric guide screws are black.

**NOTE:** If you are replacing a drive, transfer the guides screws from the old drive to the new one.

**CAUTION:** Use only 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.

**Figure 5-23** Installing a 5.25-Inch Drive in a Minitower (top) and Desktop (bottom)

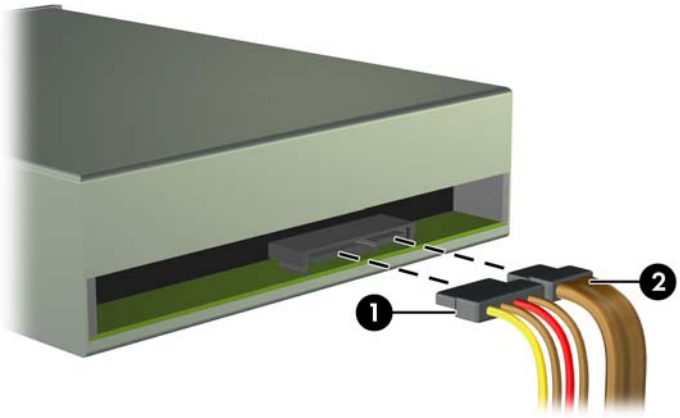



5. Install the drive in the desired drive bay by sliding it all the way into the front of the drive cage until it locks **(2)**. The drivelock automatically secures the drive in the bay.

**CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

6. Connect the power cable **(1)** and data cable **(2)** to the rear of the drive.

**Figure 5-24** Connecting the Drive Cables (Optical Drive shown)




7. If you are installing a new drive, connect the opposite end of the data cable to the appropriate system board connector.

**NOTE:** If you are installing a SATA optical drive, connect the first optical drive to the white SATA connector on the system board labeled SATA1. Connect a second optical drive to the next available (unpopulated) SATA connector following the numbered sequence of the connectors.

If your are installing a media card reader, connect the USB cable to the USB system board connector labeled MEDIA. If the media card reader includes a 1394 port, connect the 1394 cable to the 1394 PCI card.

Refer to System Board Drive Connections on page 48 for an illustration of the system board drive connectors.

8. Replace the front bezel and computer access panel.
9. Reconnect the power cord and turn on the computer.
10. Lock any security devices that were disengaged when the computer access panel was removed.
11. Reconfigure the computer, if necessary.

## Installing a 3.5-inch SATA Hard Drive into an Internal Drive Bay

**NOTE:** The system does not support Parallel ATA (PATA) hard drives.

Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

To install a hard drive in a 3.5-inch internal drive bay:

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Install four 6-32 isolation mounting guide screws, two on each side of the drive.

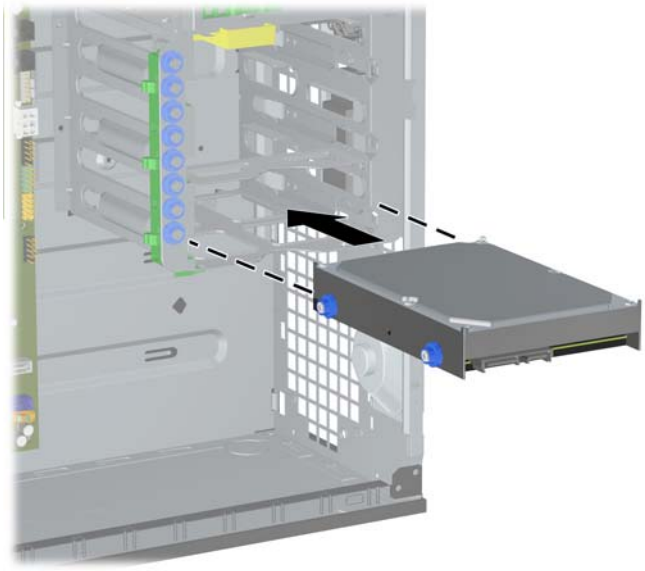
**Figure 5-25** Installing the Hard Drive Guide Screws

**NOTE:** The hard drive uses 6-32 isolation mounting guide screws. Eight extra guide screws are installed on the hard drive bracket under the access panel. The HP-supplied isolation mounting guide screws are silver and blue.

If you are replacing a drive, transfer the guides screws from the old drive to the new one.

4. Slide the hard drive down into the drive cage until it locks. The drivelock automatically secures the drive in the bay.

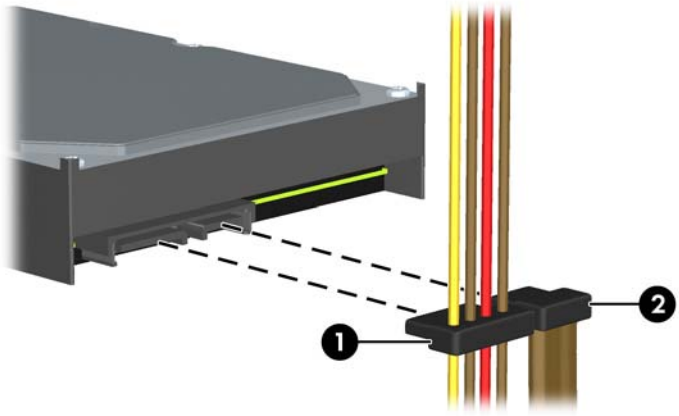
**Figure 5-26** Installing a Hard Drive into the Hard Drive Bay



**CAUTION:** Make sure the guide screws line up with the guide slots in the drive cage. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

5. Connect the power cable **(1)** and data cable **(2)** to the rear of the hard drive.

**Figure 5-27** Connecting the Power Cable and Data Cable to a SATA Hard Drive




6. Connect the opposite end of the data cable to the appropriate system board connector.

**NOTE:** If your system has only one SATA hard drive, you must connect the hard drive data cable to the dark blue connector labeled SATA0 to avoid any hard drive performance problems. If you are adding a second hard drive, connect the data cable to the next available (unpopulated) SATA connector on the system board in the following order: SATA0, SATA1, SATA2, SATA3.

7. Replace the computer access panel.
8. Reconnect the power cord and turn on the computer.
9. Lock any security devices that were disengaged when the computer access panel was removed.
10. Reconfigure the computer, if necessary.

## Removing and Replacing a Removable 3.5-inch SATA Hard Drive

Some models are equipped with a Removable SATA Hard Drive Enclosure in the 5.25-inch external drive bay. The hard drive is housed in a carrier that can be quickly and easily removed from the drive bay. To remove and replace a drive in the carrier:

**NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

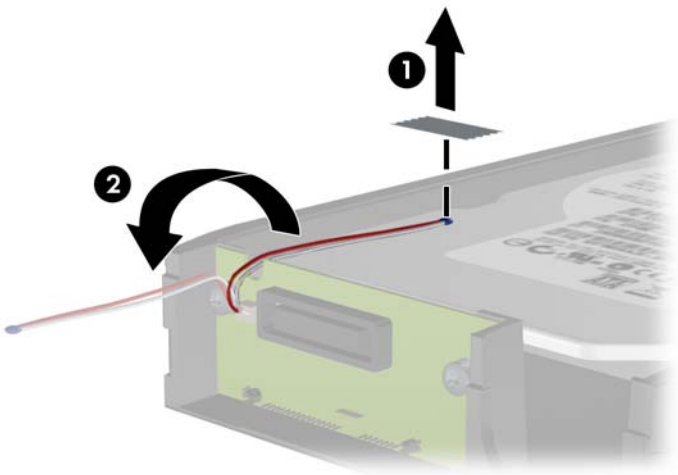
1. Unlock the hard drive carrier with the key provided and slide the carrier out of the enclosure.

2. Remove the screw from the rear of the carrier **(1)** and slide the top cover off the carrier **(2)**.

**Figure 5-28** Removing the Carrier Cover

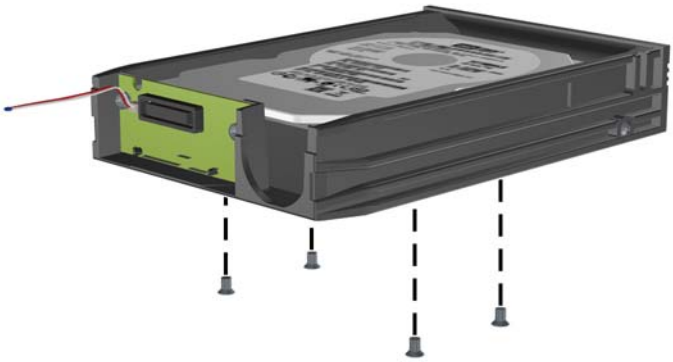

3. Remove the adhesive strip that secures the thermal sensor to the top of the hard drive **(1)** and move the thermal sensor away from the carrier **(2)**.

**Figure 5-29** Removing the Thermal Sensor



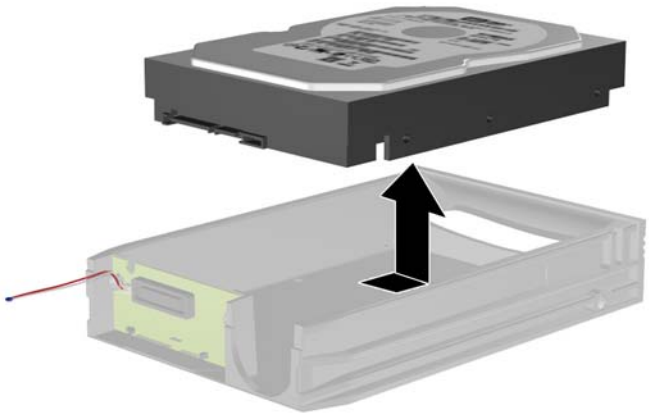
4. Remove the four screws from the bottom of the hard drive carrier.

**Figure 5-30** Removing the Security Screws



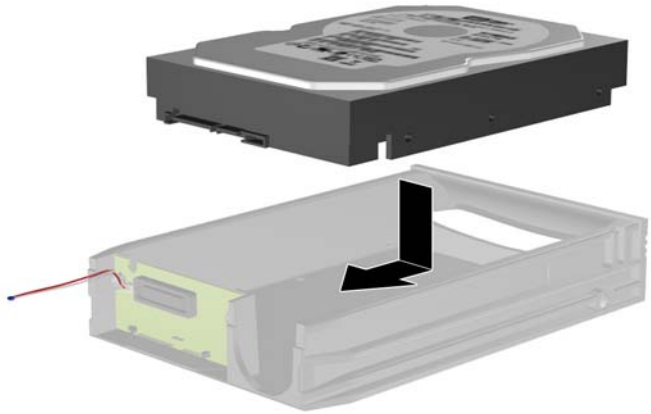
5. Slide the hard drive back to disconnect it from the carrier then lift it up and out of the carrier.

**Figure 5-31** Removing the Hard Drive



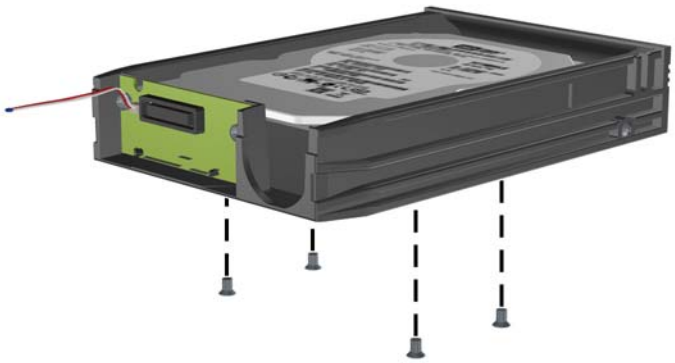
6. Place the new hard drive in the carrier then slide the hard drive back so that it seats in the SATA connector on the carrier's circuit board. Be sure the connector on the hard drive is pressed all the way into the connector on the carrier's circuit board.

**Figure 5-32** Replacing the Hard Drive



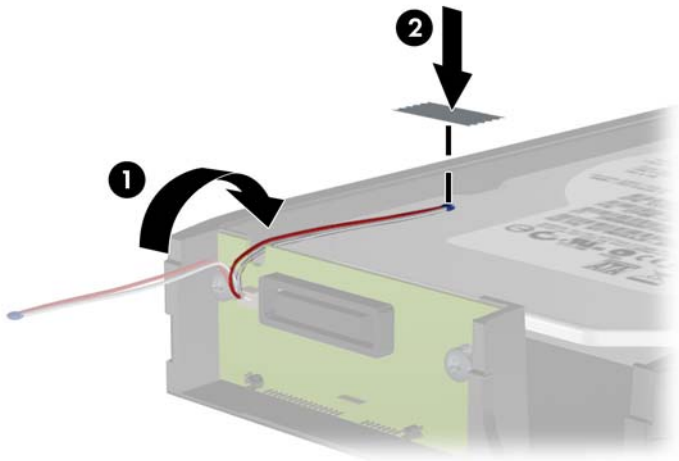
7. Replace the four screws in the bottom of the carrier to hold the drive securely in place.

**Figure 5-33** Replacing the Security Screws



8. Place the thermal sensor on top of the hard drive in a position that does not cover the label **(1)** and attach the thermal sensor to the top of the hard drive with the adhesive strip **(2)**.

**Figure 5-34** Replacing the Thermal Sensor




9. Slide the cover on the carrier **(1)** and replace the screw on the rear of the carrier to secure the cover in place **(2)**.

**Figure 5-35** Replacing the Carrier Cover


10. Slide the hard drive carrier into the enclosure on the computer and lock it with the key provided.

**NOTE:** The carrier must be locked for power to be supplied to the hard drive.

# Hood Sensor

The hood sensor is located on the top of the rear chassis panel.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Unplug the hood sensor cable from the white connector labeled HSENSE on the system board **(1)**.
4. Slide the hood sensor straight out of the slot in the chassis **(2)**.

**Figure 5-36** Removing the hood sensor


To reinstall the hood sensor, reverse the removal procedure.

# Front I/O, USB Assembly

The front I/O, USB assembly is mounted to the front of the chassis and is removed by pulling it away from the chassis.

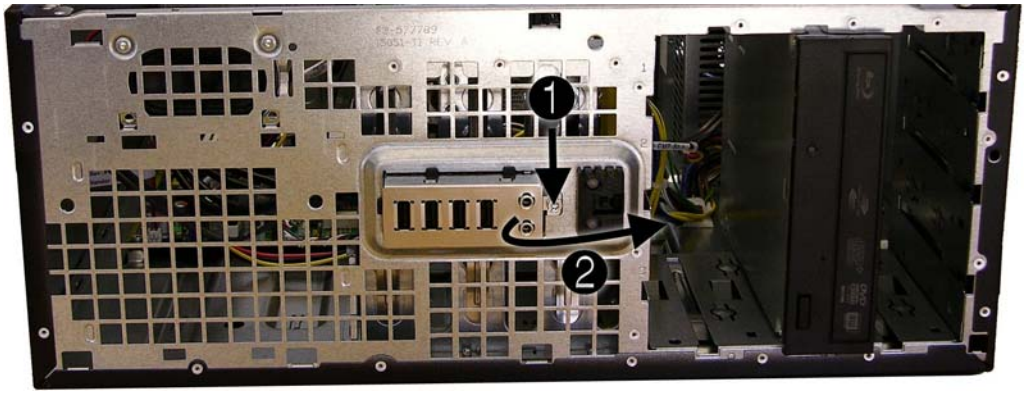
1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the front bezel (Front Bezel on page 35).
4. Disconnect the three cables from the following system board connectors:
   - Yellow connector labeled FRONT USB
   - Green connector labeled FRONT USB2
   - Blue connector labeled FRONT AUD

   **NOTE:** The blue FRONT AUD connector is not located near the other two connectors used for the front I/O assembly. See the image below for its location.

5. Remove the screw that secures the assembly to the front of the chassis **(1)**.

6. Rotate the right side of the assembly away from the chassis, and then pull the assembly toward the right and away from the chassis **(2)** while threading the wires through the slot between the drive cage and chassis front and the hole in the front of the chassis.

**Figure 5-37** Removing the front I/O, USB, power switch assembly



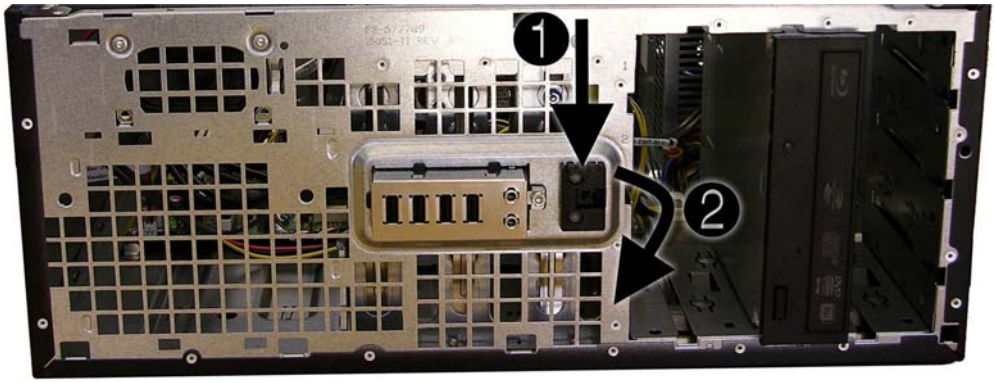

To reinstall the assembly, reverse the removal procedure.

# Power Switch Assembly

The power switch assembly is mounted to the front of the chassis and removed by pulling it away from the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the computer access panel (Front Bezel on page 35).
4. Disconnect the cable from the black system board connector labeled PB/LED.
5. Press downward on the tab **(1)** at the top of the assembly.
6. Rotate the top of the assembly downward **(2)**, and then pull it away from the chassis while threading the wires through the hole in the front of the chassis.

**Figure 5-38** Removing the power switch assembly



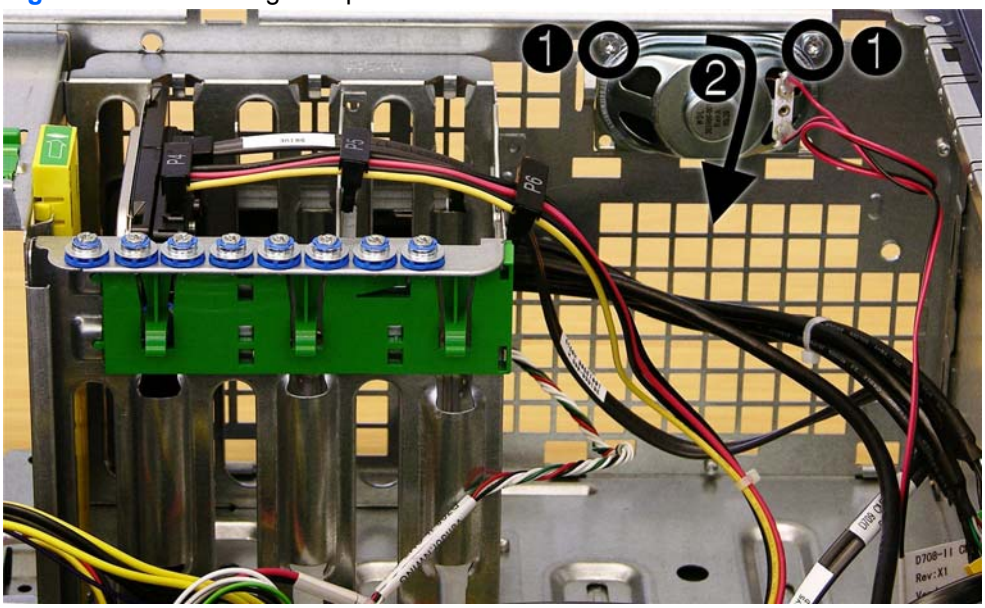

To install the power switch assembly, reverse the removal procedure.

# Speaker

The speaker is mounted to the inside front of the chassis with two screws.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Disconnect the speaker wire from the white system board connector labeled SPKR.
4. From the inside of the unit, remove the two screws **(1)** that secure the speaker to the front of the chassis.
5. Rotate the top of the speaker downward **(2)**, and then remove it from the chassis.

**Figure 5-39** Removing the speaker




To install the speaker, reverse the removal procedures.

# Rear Chassis Fan

The rear fan is mounted to the rear chassis wall and secured by four Phillips screws.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Disconnect the fan control cable from the red/brown system board labeled CHFAN2.
4. Remove the four screws that secure the fan housing to the chassis.
5. Remove the fan from the chassis.

**Figure 5-40** Removing the rear chassis fan

To install the fan, reverse the removal procedure. Be sure to orient the air flow out of the unit.

# Heat sink

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Disconnect the fan cable from the white system board connector labeled CPUFAN **(1)**.
4. Unscrew the four captive screws **(2)** that secure the heat sink to the system board.

△ **CAUTION:** Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

5. Lift the heat sink from the processor.

**Figure 5-41** Removing the heat sink


When reinstalling the heat sink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor.

△ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. Failure to do so could result in damage that requires replacing the system board.

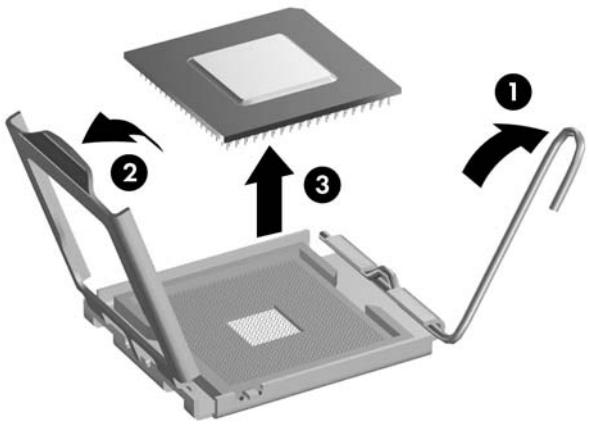
# Processor

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the heat sink (Heat sink on page 68).
4. Rotate the locking lever to its full open position **(1)**.
5. Raise and rotate the microprocessor retainer to its fully open position **(2)**.
6. Carefully lift the processor from the socket **(3)**).

△ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.

**Figure 5-42** Removing the processor




To install a new processor:

1. Place the processor in its socket and close the retainer.
2. Secure the locking lever.

   If reusing the existing heat sink, go to step 3.

   If using a new heat sink, go to step 5.
3. If reusing the existing heat sink, apply the thermal grease provided in the spares kit to the top of the processor.
4. Clean the bottom of the heat sink with the provided alcohol pad and place it atop the processor.

5. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.

6. Secure the heat sink to the system board and system board tray with the 4 captive screws and attach the heat sink control cable to the system board.

△ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

**NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: http://h18000.www1.hp.com/support/files.

# Power Supply

⚠ **WARNING!** To reduce potential safety issues, only the power supply provided with the computer, a replacement power supply provided by HP, or a power supply purchased as an accessory from HP should be used with the computer.

The power supply is secured to the rear of the chassis by four Torx screws. A lever on the chassis floor also holds the power supply in place.

The power supply is secured by two security screws that require use of a Smart Cover FailSafe Key to remove.

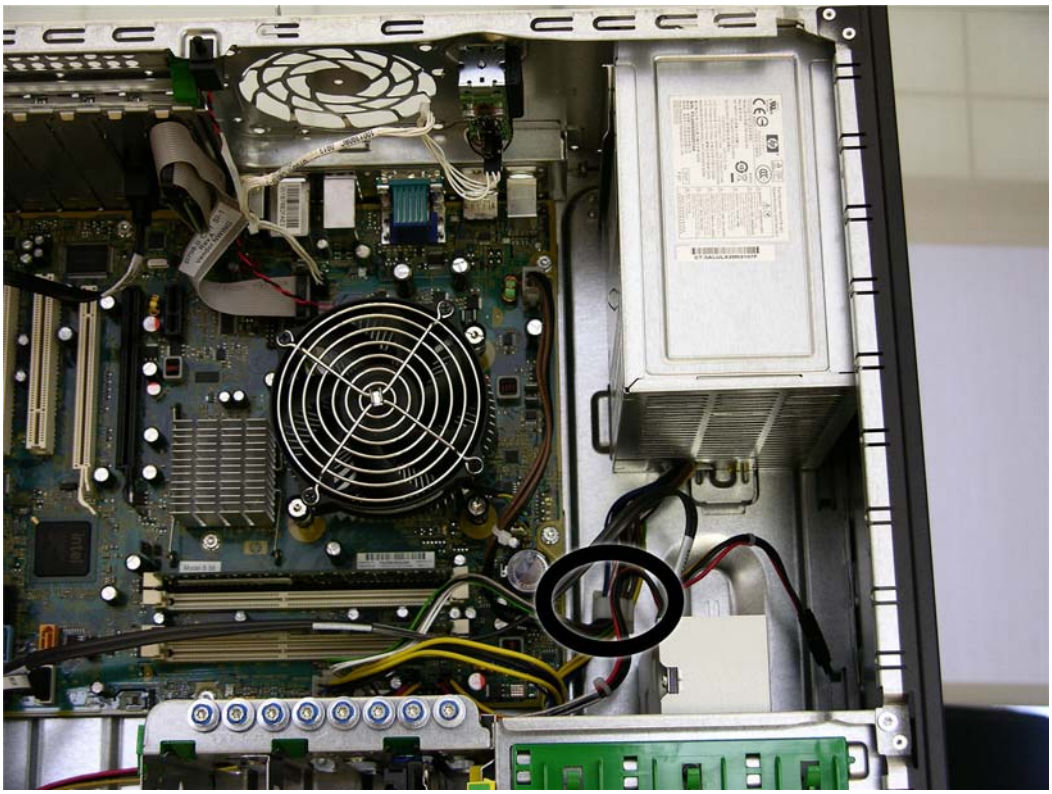
**NOTE:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need it.

Perform any of the following to obtain a FailSafe Key:

- Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.
- Refer to the HP Web site (http://www.hp.com) for ordering information.
- Call the appropriate number listed in the warranty or in the *Support Telephone Numbers* guide.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Disconnect all power cables from the mass storage devices and from the system board.

4. Remove the power cables from the white plastic clamp on the chassis floor.



5. Remove the two Torx screws **(1)** and the two security screws **(2)** that connect the power supply to the chassis.

**Figure 5-43** Removing the power supply, screw locations

6. Press the tab in front of the power supply that holds it in place.

**Figure 5-44** Removing the power supply, release lever

7. Slide the power supply toward the front of the computer, rotate toward the fan so the power supply clears the lip on the top of the chassis, and then lift the power supply out of the chassis.

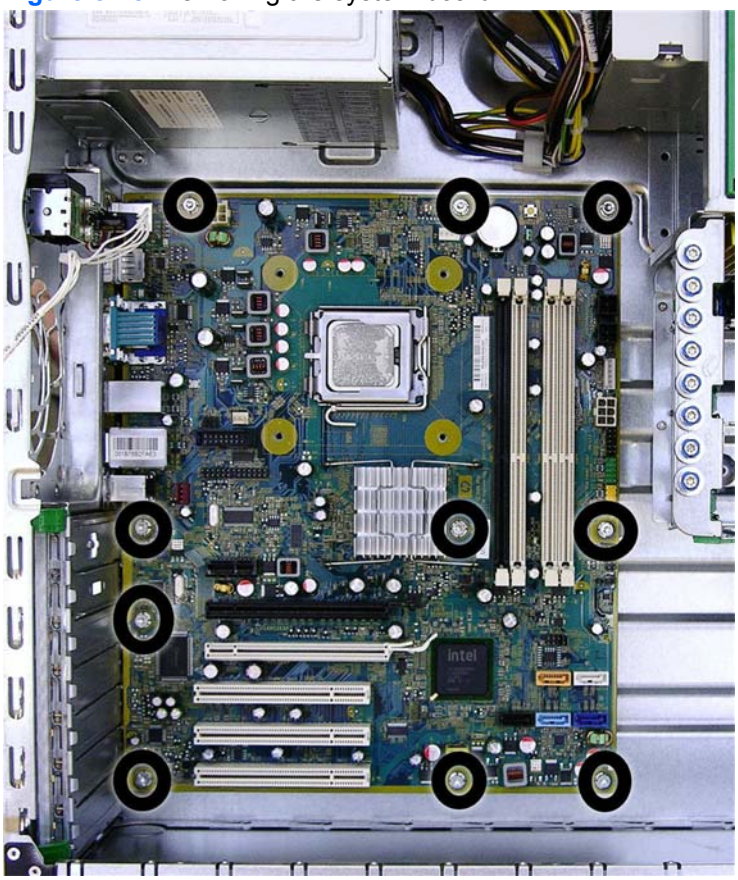
To install the power supply, reverse the removal procedure.

# System Board

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. When replacing the system board, make sure the following components are removed from the defective system board and installed on the replacement system board:
   - Memory modules (seeInstalling Additional Memory on page 39)
   - Expansion cards (Expansion Cards on page 43)
   - Heat sink (Heat sink on page 68).
   - Processor (Processor on page 69)
3. Remove the computer access panel (Computer Access Panel on page 34).
4. Disconnect all cables connected to the system board, noting their location for reinstallation.
5. Remove the 10 screws that secure the system board to the chassis.
6. Slide the system board toward the front of the computer so that the connectors loosen from the rear of the chassis.

7. Lift the system board out of the computer.

**Figure 5-45** Removing the system board



**NOTE:** When replacing the system board, you must also change the chassis serial number in the BIOS.

**CAUTION:** Before reinstalling the heat sink you must clean the top of the processor and the bottom of the heat sink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.

# Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

**NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

⚠ **WARNING!** This computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 140°F (60°C).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare designated for this product.

△ **CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to Computer Setup (F10) Utility on page 4 for information on backing up the CMOS settings.

**NOTE:** HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to http://www.hp.com/recycle.

△ **CAUTION:** Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).

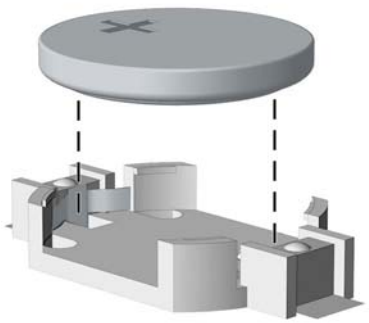
   **NOTE:** It may be necessary to remove an expansion card to gain access to the battery.

3. Locate the battery and battery holder on the system board.
4. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

## Type 1 Battery Holder

1. Lift the battery out of its holder.

   **Figure 5-46** Removing the battery from a type 1 holder



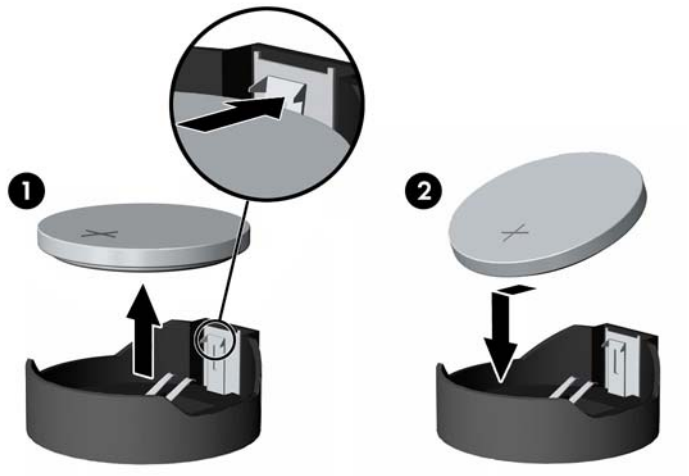
2. Slide the replacement battery into position, positive side up.
3. The battery holder automatically secures the battery in the proper position.
4. Replace the computer access panel.

5. Plug in the computer and turn on power to the computer.
6. Reset the date and time and any special system setups using Computer Setup. Refer to Computer Setup (F10) Utility on page 4.

## Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp **(1)** that extends above one edge of the battery. When the battery pops up, lift it out.
2. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up **(2)**. Push the other edge down until the clamp snaps over the other edge of the battery.

**Figure 5-47** Removing the battery from a type 2 holder



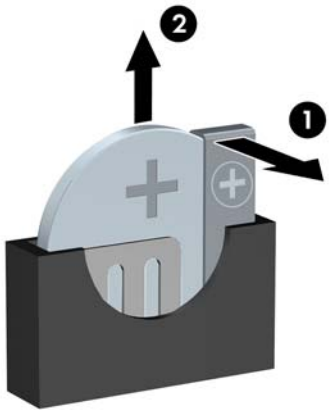

3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time and any special system setups using Computer Setup. Refer to Computer Setup (F10) Utility on page 4.

## Type 3 Battery Holder

1. Pull back on the clip **(1)** that holds the battery in place, then remove the battery **(2)**.

2. Insert the new battery and position the clip back in place.

**Figure 5-48** Removing the battery from a type 3 holder




3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time and any special system setups using Computer Setup.

# External Security Devices

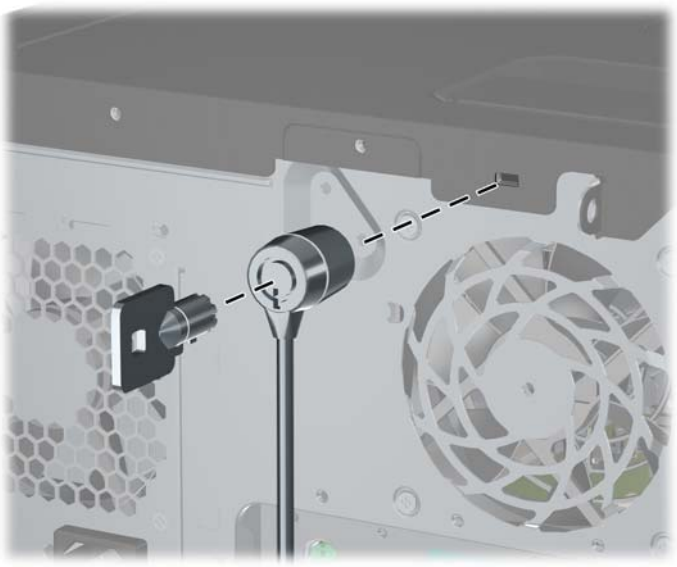
The following security devices are used to prevent unauthorized access to the internal components of the computer and/or secure the computer to a fixed object.

## Installing a Security Lock

The security locks displayed below and on the following page can be used to secure the computer.

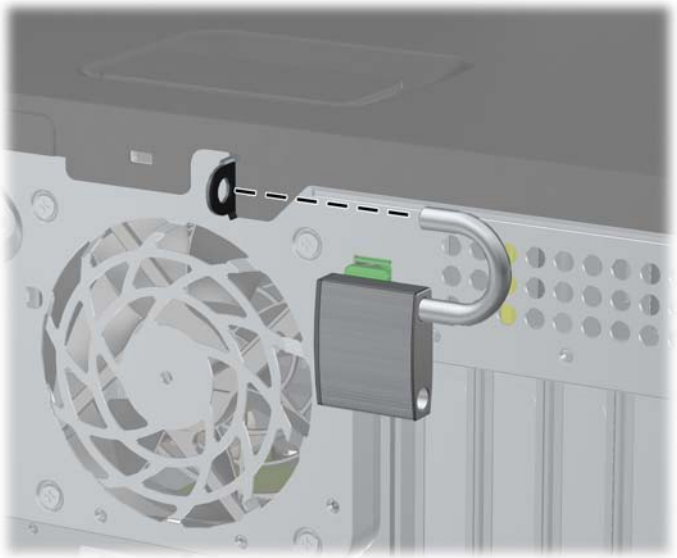
### HP/Kensington MicroSaver Security Cable Lock

**Figure 5-49** Installing a Cable Lock



## Padlock

**Figure 5-50** Installing a Padlock



## HP Business PC Security Lock

1. Fasten the security cable by looping it around a stationary object.

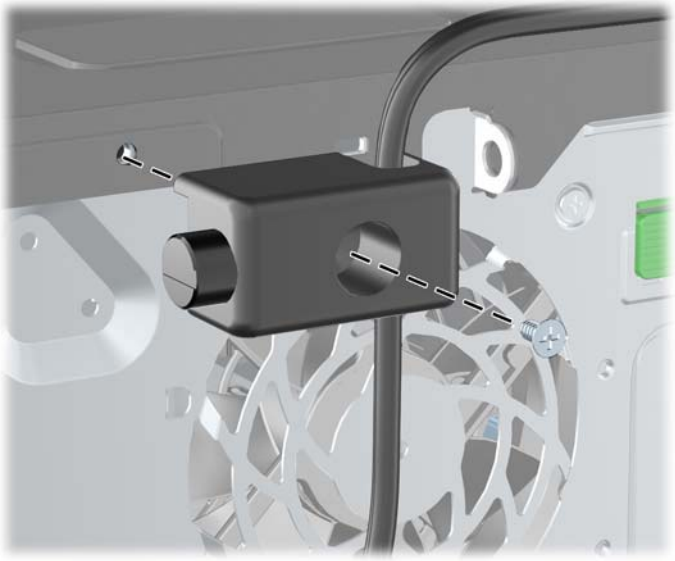
**Figure 5-51** Securing the Cable to a Fixed Object

2. Thread the keyboard and mouse cables through the lock.

**Figure 5-52** Threading the Keyboard and Mouse Cables

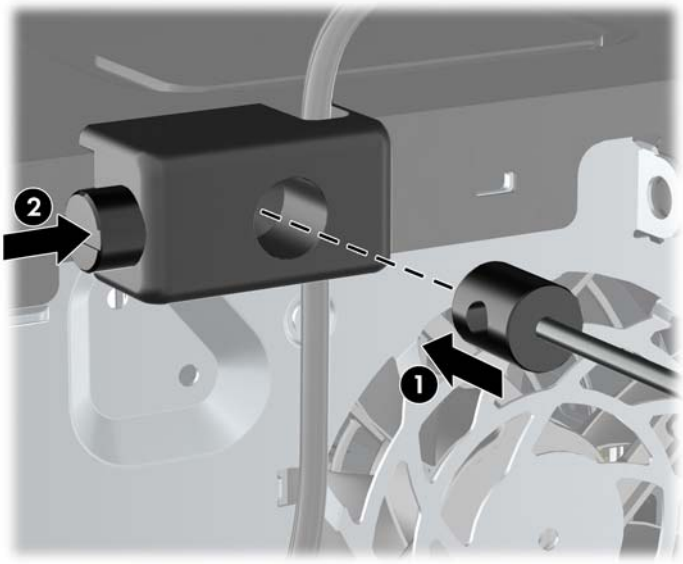
3. Screw the lock to the chassis using the screw provided.

**Figure 5-53** Attaching the Lock to the Chassis



4. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 5-54** Engaging the Lock




## Front Bezel Security

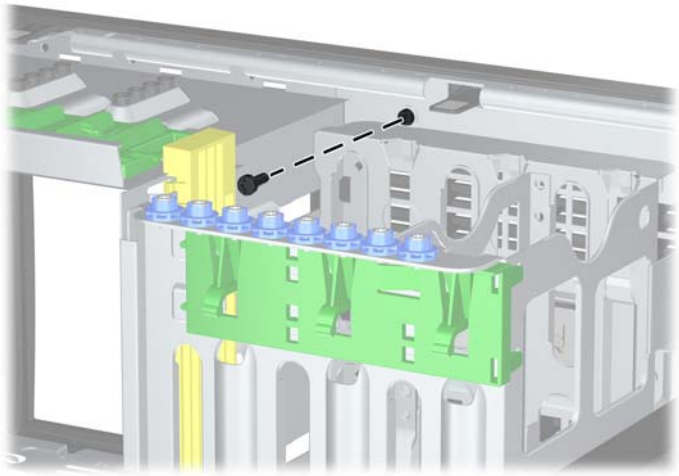
The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Prepare the computer for disassembly (Preparation for Disassembly on page 31).
2. Remove the computer access panel (Computer Access Panel on page 34).
3. Remove the front bezel (Front Bezel on page 35).
4. Remove the security screw from the inside of the front bezel.

**Figure 5-55** Retrieving the Front Bezel Security Screw

5. Replace the front bezel.
6. Install the screw through the interior of the front of the chassis into the front bezel. The screw hole is located on the left edge of the chassis next to the top hard drive bay.

**Figure 5-56** Installing the Front Bezel Security Screw



7. Replace the access panel.
8. Reconnect the power cord and turn on the computer.
9. Lock any security devices that were disengaged when the access panel was removed.

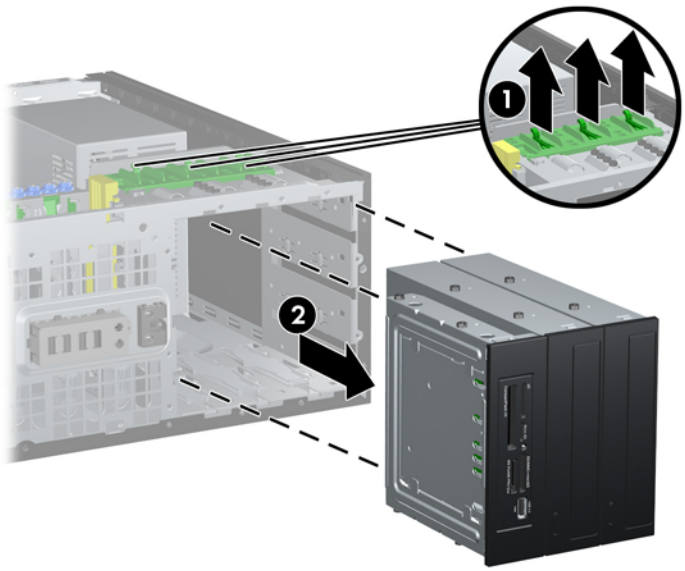
# Changing from a Minitower to a Desktop Configuration

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

△ **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

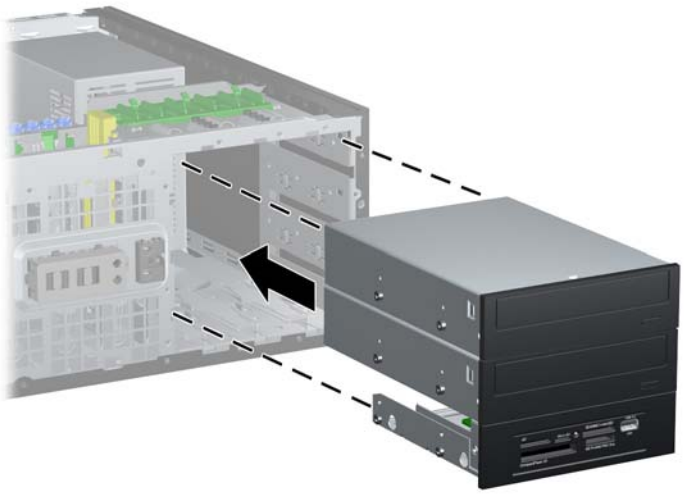
5. Remove the computer access panel.
6. Remove the front bezel.
7. Disconnect all power and data cables from the back of the drives in the 5.25-inch drive bays.
8. To release the drives from the 5.25-inch drive bay, lift the release tab on the green latch drive bracket for the drive (1). While lifting the release tab, slide the drive from its drive bay (2). Repeat this step for each 5.25-inch drive.

**Figure 5-57** Releasing the 5.25-inch Drives from the Drive Bays (Minitower)



9. Gently slide the drive into the uppermost available bay until it snaps into place. When the drive is properly inserted, the drivelock will secure it. Repeat this step for each drive.

**Figure 5-58** Installing a Drive in the Desktop Configuration



△ **CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

10. Reconnect all power and data cables to the drives in the 5.25-inch drive bays.

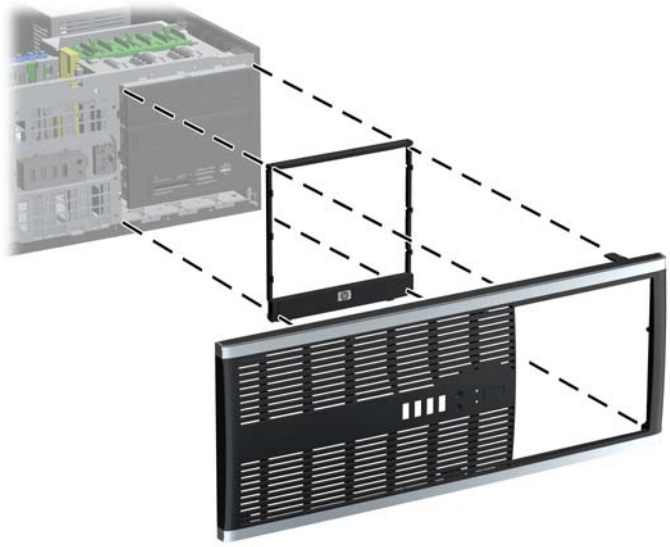
11. Remove the bezel subpanel as described in Bezel Blanks on page 36.

△ **CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.

12. Reposition the bezel blanks within the subpanel in the proper orientation for the desktop configuration.

13. Reposition the subpanel (rotate it 90º) with the logo at the bottom, then snap it back into the bezel.

**Figure 5-59** Changing from a Minitower to a Desktop Configuration



14. Replace the front bezel and computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer access panel was removed.

# Changing from a Desktop to a MinitowerConfiguration

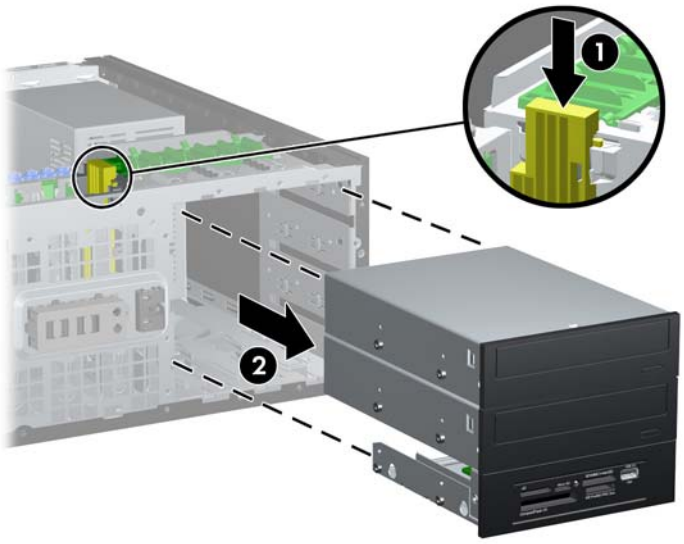
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

△ **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the computer access panel.
6. Remove the front bezel.
7. Disconnect all power and data cables from the back of the drives in the 5.25-inch drive bays.

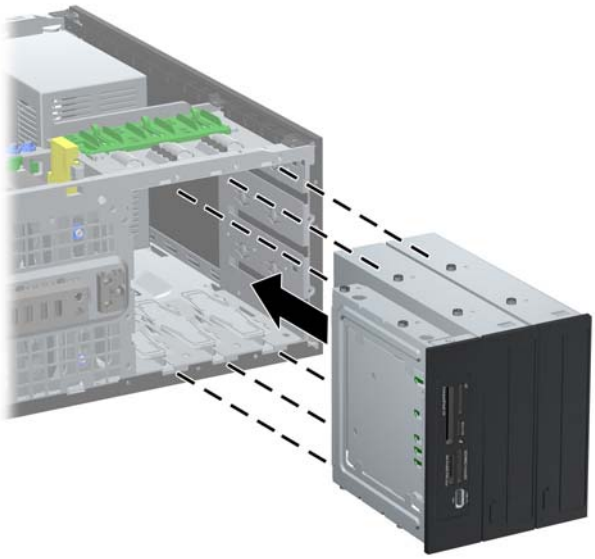
8. To release the drives from the 5.25-inch drive bay, press down on the short yellow drivelock as shown (1). While pressing the drivelock, pull the drives out of the drive bay (2).

**Figure 5-60** Releasing the 5.25-inch Drives from the Drive Bays (Desktop)




9. Gently slide the drive into the uppermost available bay until it snaps into place. When the drive is properly inserted, the drivelock will secure it. Repeat this step for each drive.

**Figure 5-61** Installing a Drive in the Minitower Configuration



△ **CAUTION:** The bottom 5.25-inch drive bay has a shorter depth than the upper two bays. The bottom bay supports a half-height drive or other device that is no more than 14.5 cm (5.7 inches) in depth. Do not try to force a larger drive, such as an optical drive, into the bottom bay. This could cause damage to the drive and the system board. The use of unnecessary force when installing any drive into the drive bay may result in damage to the drive.

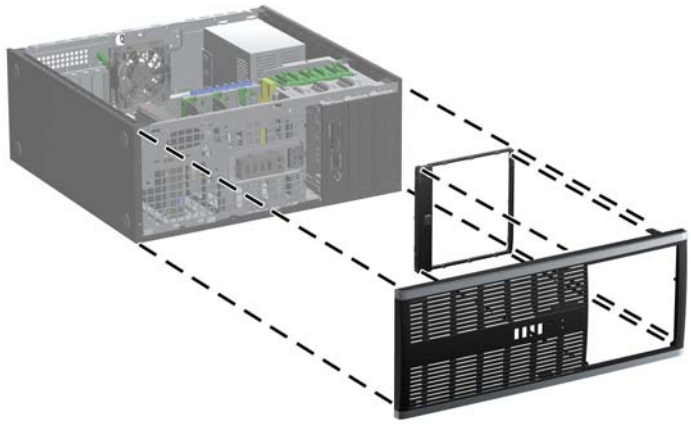
10. Reconnect all power and data cables to the drives in the 5.25-inch drive bays.

11. Remove the bezel subpanel as described in the Bezel Blanks on page 36 section.

△ **CAUTION:** Hold the subpanel straight when you pull it away from the front bezel. Pulling the subpanel away at an angle could damage the pins that align it within the front bezel.

12. Reposition the bezel blanks within the subpanel in the proper orientation for the minitower configuration.
13. Reposition the subpanel (rotate it 90º) with the logo at the bottom, then snap it back into the bezel.

**Figure 5-62** Changing from a Desktop to a Minitower Configuration



14. Replace the front bezel and computer access panel.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer access panel was removed.

# 6 Removal and Replacement Procedures Small Form Factor (SFF) Chassis

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

**NOTE:** Not all features listed in this guide are available on all computers.

## Preparation for Disassembly

See Identifying the Chassis, Routine Care, and Disassembly Preparation on page 21 for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer (Unlocking the Smart Cover Lock on page 32 and External Security Devices on page 90).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any compact disc or media card from the computer.
5. Turn off the computer and any peripheral devices that are connected to it.

   **CAUTION:** Turn off the computer before disconnecting any cables.

   Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the “Standby,” or “Suspend” modes. The power cord should always be disconnected before servicing a unit.
6. Disconnect the power cord from the electrical outlet and then from the computer.
7. Disconnect all peripheral device cables from the computer.

**NOTE:** During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

**CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

# Unlocking the Smart Cover Lock

**NOTE:** The Smart Cover Lock is an optional feature included on some models only.

The Smart Cover Lock is a software-controllable cover lock, controlled by the setup password. This lock prevents unauthorized access to the internal components. The computer ships with the Smart Cover Lock in the unlocked position. For more information about locking the Smart Cover Lock, refer to the *Desktop Management Guide*.

## Smart Cover FailSafe Key

If you enable the Smart Cover Lock and cannot enter your password to disable the lock, you will need a Smart Cover FailSafe Key to open the computer cover. You will need the key to access the internal computer components in any of the following circumstances:

- Power outage
- Startup failure
- PC component (for example, processor or power supply) failure
- Forgotten password

**NOTE:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need it.

To obtain a FailSafe Key:

- Contact an authorized HP reseller or service provider. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.
- Refer to the HP Web site (http://www.hp.com) for ordering information.
- Call the appropriate number listed in the warranty or in the *Support Telephone Numbers* guide.

## Using the Smart Cover FailSafe Key to Remove the Smart Cover Lock

To open the access panel with the Smart Cover Lock engaged:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

   **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.

6. Use the Smart Cover FailSafe Key to remove the tamper-proof screw that secures the Smart Cover Lock to the chassis.

**Figure 6-1** Removing the Smart Cover Lock Screw

You can now remove the access panel. See Computer Access Panel on page 150.

To reattach the Smart Cover Lock, secure the lock in place with the tamper-proof screw.

# External Security Devices

**NOTE:** For information on data security features, refer to the *Desktop Management Guide* and the *HP ProtectTools Security Manager Guide* (some models) at http://www.hp.com.

## Installing a Security Lock

The security locks displayed below and on the following pages can be used to secure the computer.

### HP/Kensington MicroSaver Security Cable Lock

**Figure 6-2** Installing a Cable Lock

## Padlock

**Figure 6-3** Installing a Padlock

## HP Business PC Security Lock

1. Fasten the security cable by looping it around a stationary object.

**Figure 6-4** Securing the Cable to a Fixed Object

2. Thread the keyboard and mouse cables through the lock.

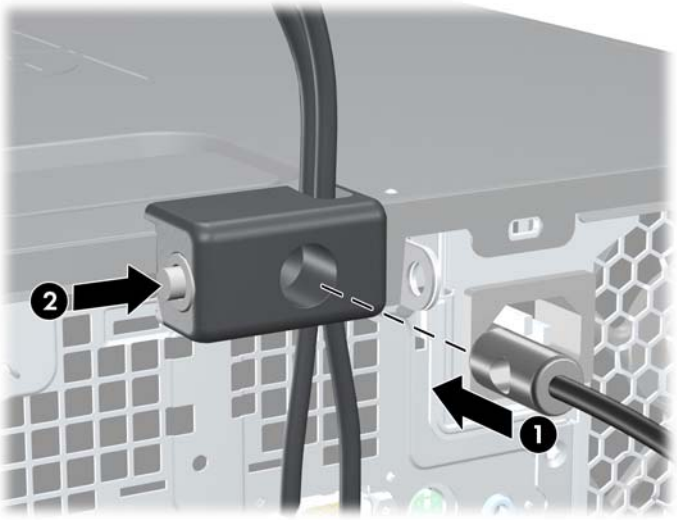
**Figure 6-5** Threading the Keyboard and Mouse Cables

3. Screw the lock to the chassis using the screw provided.

**Figure 6-6** Attaching the Lock to the Chassis

4. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 6-7** Engaging the Lock




## Front Bezel Security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

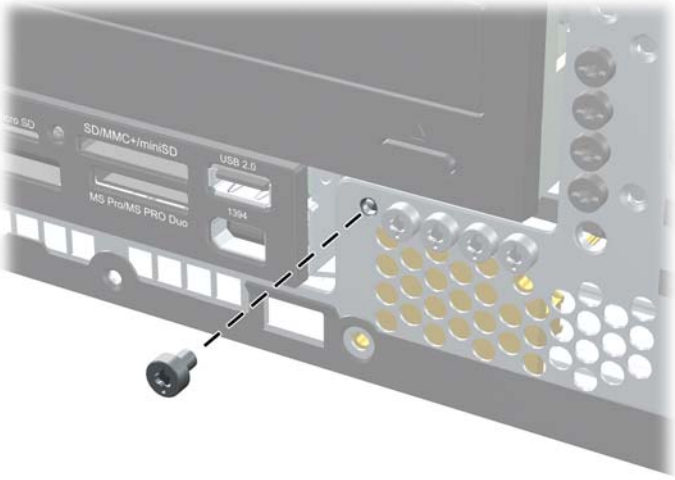
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

△ **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the access panel and front bezel.

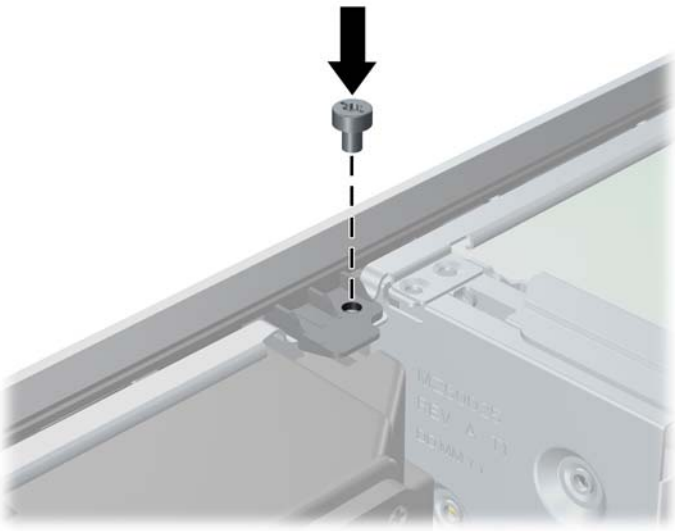
7. Remove one of the five silver 6-32 standard screws located on the front of the chassis behind the bezel.

**Figure 6-8** Retrieving the Front Bezel Security Screw




8. Replace the front bezel.
9. Install the security screw next to the middle front bezel release tab to secure the front bezel in place.

**Figure 6-9** Installing the Front Bezel Security Screw

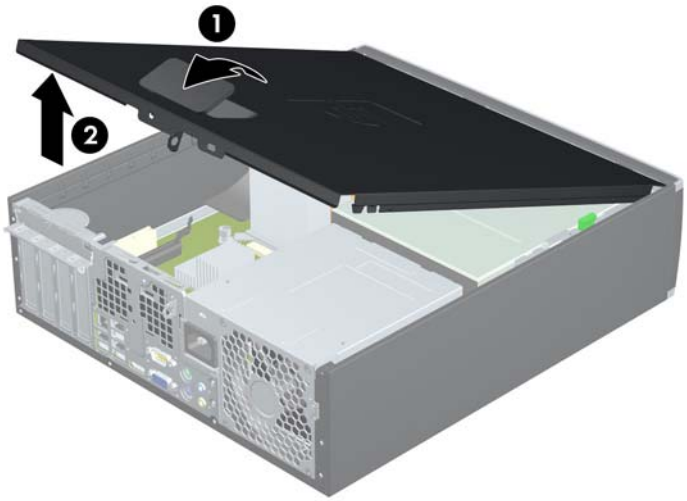


10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

# Computer Access Panel

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. If the computer is on a stand, remove the computer from the stand.
3. Lift up on the access panel handle **(1)** then lift the access panel off the computer **(2)**.

**Figure 6-10** Removing the Access Panel

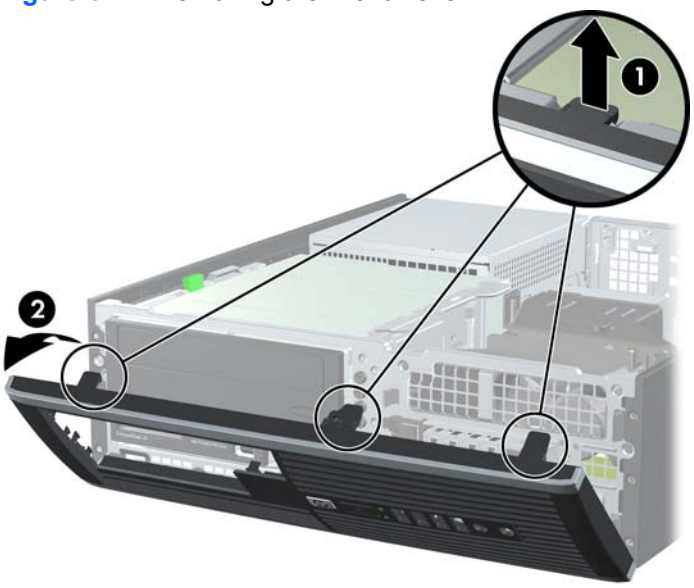



To install the access panel, reverse the removal procedure.

# Front Bezel

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Lift up the three tabs on the side of the bezel **(1)**, then rotate the bezel off the chassis **(2)**.

**Figure 6-11** Removing the Front Bezel



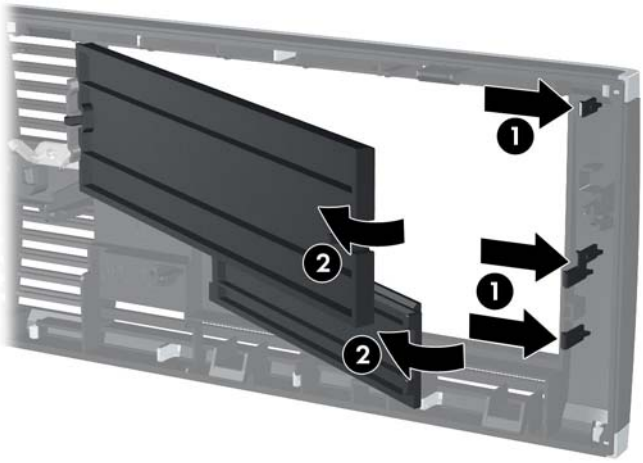

To install the front bezel, reverse the removal procedure.

# Bezel Blanks

On some models, there are bezel blanks covering the 3.5-inch and 5.25-inch external drive bays that need to be removed before installing a drive. To remove a bezel blank:

1. Remove the access panel (Computer Access Panel on page 95).
2. Remove the front bezel (Front Bezel on page 96)..
3. To remove a bezel blank, push the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel **(1)** and slide the bezel blank back and to the right to remove it **(2)**.

   **Figure 6-12** Removing a Bezel Blank

4. Replace the front bezel.

# Installing Additional Memory

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

## DIMMs

The memory sockets on the system board can be populated with up to four industry-standard DIMMs. These memory sockets are populated with at least one preinstalled DIMM. To achieve the maximum memory support, you can populate the system board with up to 16-GB of memory configured in a high-performing dual channel mode.

## DDR3-SDRAM DIMMs

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-8500 DDR3-1066 MHz-compliant or PC3-10600 DDR3-1333 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 7 DDR3 1066 MHz (7-7-7 timing) and CAS latency 9 DDR3 1333 MHz (9-9-9 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

**NOTE:** The system will not operate properly if you install unsupported DIMMs.

## Populating DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled DIMM1, DIMM2, DIMM3, and DIMM4. Sockets DIMM1 and DIMM2 operate in memory channel A. Sockets DIMM3 and DIMM4 operate in memory channel B.

**Figure 6-13** DIMM Socket Locations

**Table 6-1 DIMM Socket Locations**

| Item | Description | Socket Color |
|---|---|---|
| 1 | DIMM1 socket, Channel A (populate first) | Black |
| 2 | DIMM2 socket, Channel A (populate third) | White |
| 3 | DIMM3 socket, Channel B (populate second) | White |
| 4 | DIMM4 socket, Channel B (populate fourth) | White |

**NOTE:** A DIMM must occupy the black DIMM1 socket. Otherwise, the system will display a POST error message indicating that a memory module must be installed in the wrong socket.

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the DIMMs are installed.

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMMs in Channel A is equal to the total memory capacity of the DIMMs in Channel B. The technology and device width can vary between the channels. For example, if Channel A is populated with two 1-GB DIMMs and Channel B is populated with one 2-GB DIMM, the system will operate in dual channel mode.
- The system will operate in flex mode if the total memory capacity of the DIMMs in Channel A is not equal to the total memory capacity of the DIMMs in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. For optimal speed, the channels should be balanced so that the largest amount of memory is spread between the two channels. If one channel will have more memory than the other, the larger amount should be assigned to Channel A. For example, if you are populating the sockets with one 2-GB DIMM, and three 1-GB DIMMs, Channel A should be populated with the 2-GB DIMM and one 1-GB DIMM, and Channel B should be populated with the other two 1-GB DIMMs. With this configuration, 4-GB will run as dual channel and 1-GB will run as single channel.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

△ **CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board. If you see an LED light on the system board, voltage is still present.

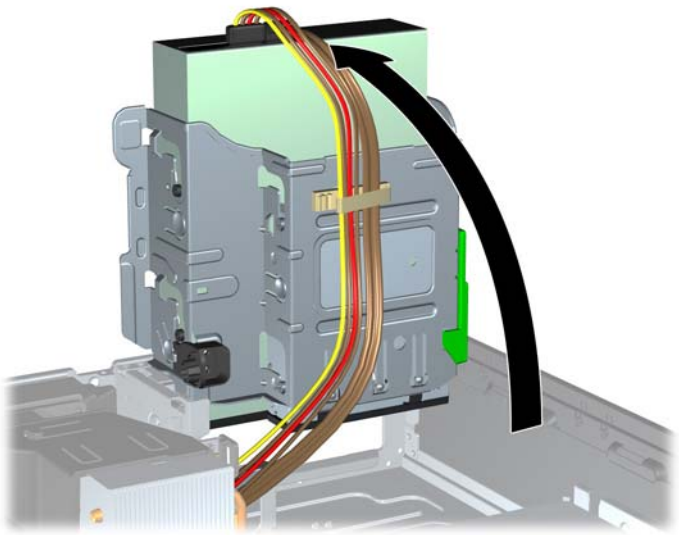
The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

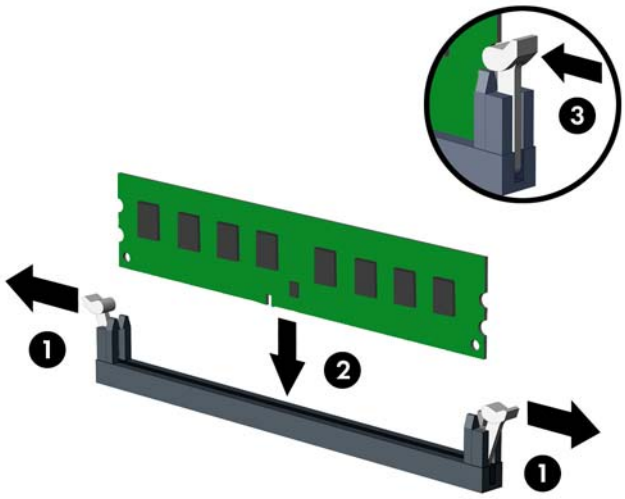
1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Rotate up the external drive bay housing to access the memory module sockets on the system board.

**Figure 6-14** Rotating the Drive Cage Up



4. Open both latches of the memory module socket **(1)**, and insert the memory module into the socket **(2)**.

**Figure 6-15** Installing a DIMM




**NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

A DIMM must occupy the black DIMM1 socket.

Populate the DIMM sockets in the following order: DIMM1, DIMM3, DIMM2, then DIMM4.

For maximum performance, populate the sockets so that the memory capacity is spread as equally as possible between Channel A and Channel B. Refer to Populating DIMM Sockets on page 40 for more information.

5. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position **(3)**.
6. Repeat steps 4 and 5 to install any additional modules.
7. Replace the access panel.
8. If the computer was on a stand, replace the stand.
9. Reconnect the power cord and turn on the computer.
10. Lock any security devices that were disengaged when the access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

# Expansion Cards

The computer has one PCI expansion slot, two PCI Express x1 expansion slots, and one PCI Express x16 expansion slot.

**NOTE:** The PCI and PCI Express slots support only low profile cards.

**Figure 6-16** Expansion Slot Locations

**Table 6-2 Expansion Slot Locations**

| Item | Description |
|---|---|
| 1 | PCI expansion slot |
| 2 | PCI Express x16 expansion slot |
| 3 | PCI Express x1 expansion slot |
| 4 | PCI Express x1 expansion slot |

**NOTE:** You can install a PCI Express x1, x4, x8, or x16 expansion card in the PCI Express x16 slot.

To install an expansion card:

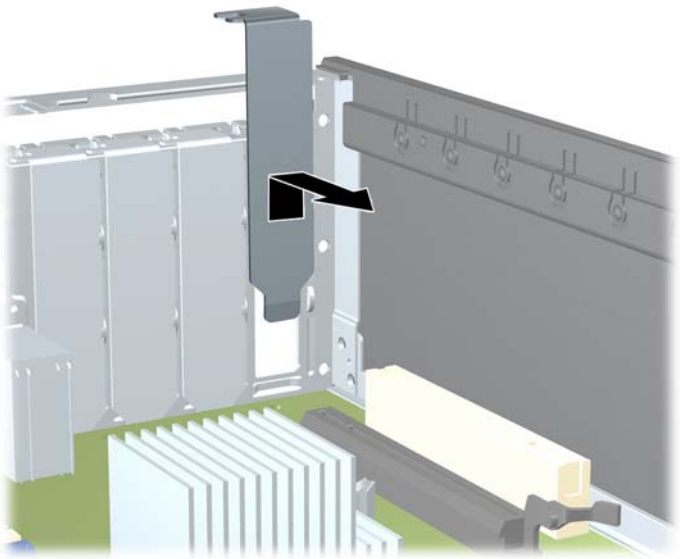
1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
4. Release the slot cover retention latch that secures the PCI slot covers by lifting the green tab on the latch and rotating the latch to the open position.

**Figure 6-17** Opening the Expansion Slot Retainer

5. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.

   a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of the chassis.

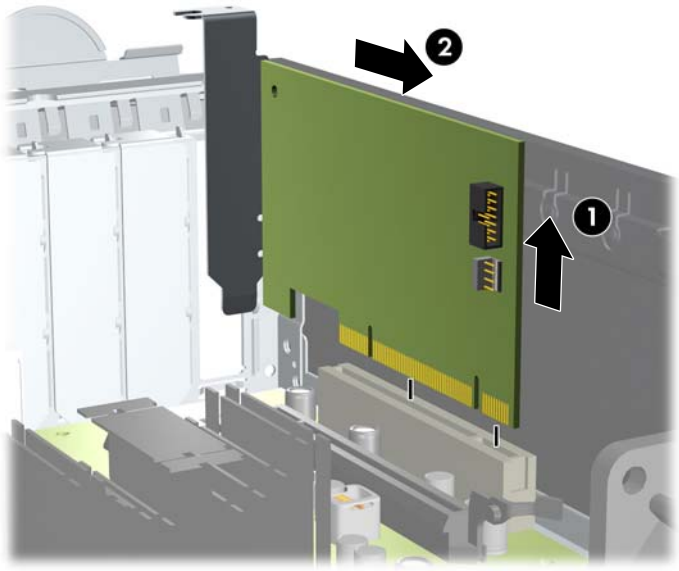
   **Figure 6-18** Removing an Expansion Slot Cover



**b.** If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket **(1)** then away from the inside of the chassis to release it from the chassis frame **(2)**. Be sure not to scrape the card against the other components.

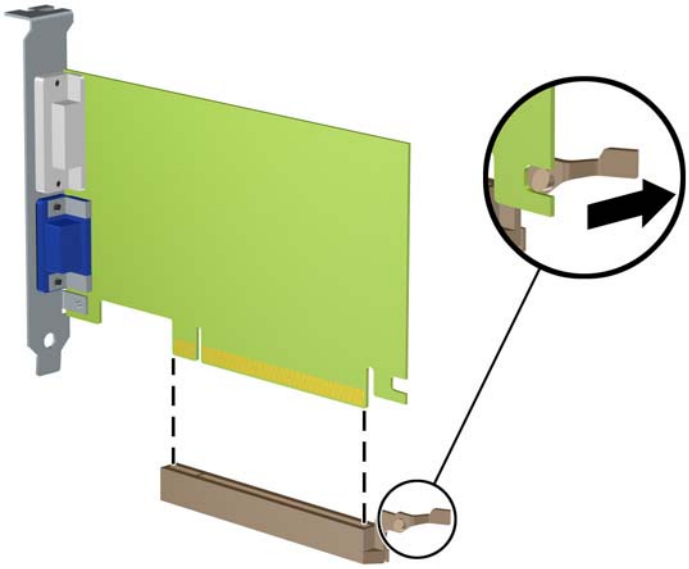
**NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

**Figure 6-19** Removing a Standard PCI Expansion Card



c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket then away from the inside of the chassis to release it from the chassis frame. Be sure not to scrape the card against the other components.

**Figure 6-20** Removing a PCI Express x16 Expansion Card

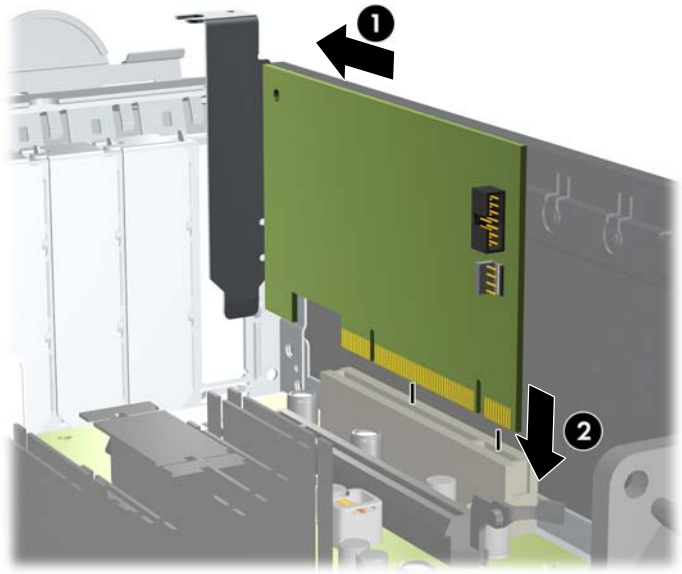


6. Store the removed card in anti-static packaging.
7. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

△ **CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

8. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis **(1)** so that the bracket on the card is aligned with the open slot on the rear of the chassis. Press the card straight down into the expansion socket on the system board **(2)**.

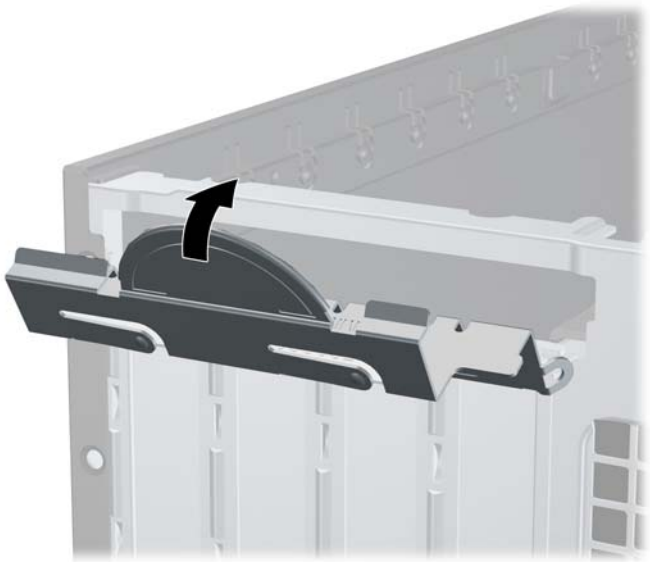
**Figure 6-21** Installing an Expansion Card




**NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

9. Rotate the slot cover retention latch back in place to secure the expansion card.

**Figure 6-22** Closing the Expansion Slot Retainer



10. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.
11. Replace the access panel.
12. If the computer was on a stand, replace the stand.

13. Reconnect the power cord and turn on the computer.
14. Lock any security devices that were disengaged when the access panel was removed.
15. Reconfigure the computer, if necessary.

# Cable Management

The Small Form Factor chassis is a very compact computer and proper routing of the internal cables is critical to the operation of the computer. Follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.
- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.
- Keep cables clear of movable or rotating parts like the power supply and drive cage to prevent them from being cut or crimped when the component is lowered into its normal position.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come prefolded. Never change the folds on these cables.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.
- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

When removing the power supply power cables from the connector on the system board, always follow these steps:

1. Squeeze on the top of the retaining latch attached to the cable end of the connector **(1)**.
2. Grasp the cable end of the connector and pull it straight up **(2)**.

△ **CAUTION:** Always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.

**Figure 6-23** 6-pin power connector

## Cable Connections

System board connectors are color-coded to make it easier to find the proper connection.

| System Board Connector | Connector Color | Description |
|---|---|---|
| P1 | White | Power supply, 6-pin |
| PWRCPU | White | Power supply, 4-pin |
| SATA PWR1 | Black | ODD power connector |
| SATA PWR2 | Black | HDD power connector |
| CHFAN | Brown | Chassis fan |
| PB/LED | Black | Front power button/LED |
| FRONT USB1 | Yellow | Front I/O USB |
| FRONT USB2 | Green | Front I/O USB |
| FRONT AUD | Blue | Front audio |
| SPKR | White | Internal speaker |
| COMB | Black | Serial port |
| HLOCK | Black | Hood lock solenoid |
| HSENSE | White | Hood sensor |
| MEDIA | Black | Media card reader |
| PAR | Black | Flying parallel port header |

# Drives

A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.

△ **CAUTION:** Make sure personal files on the hard drive are backed up to an external storage device before removing the hard drive. Failure to do so will result in data loss. After replacing the primary hard drive, you will need to run the *Restore Plus!* CD to load the HP factory-installed files.

## Drive Positions

**Figure 6-24** Drive Positions

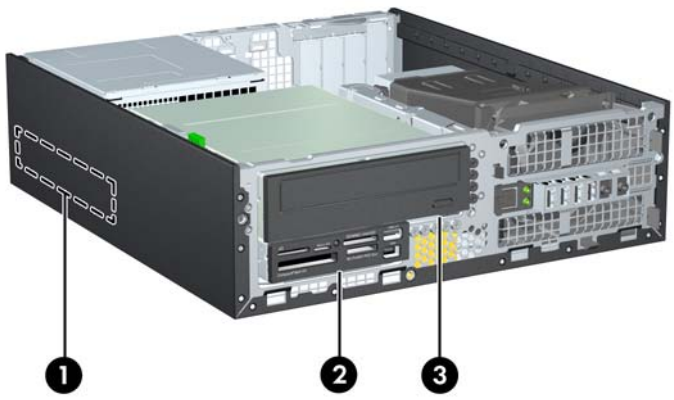


**Table 6-3 Drive Positions**

| | |
|---|---|
| 1 | 3.5-inch internal hard drive bay |
| 2 | 3.5-inch external drive bay for optional drives (media card reader shown) |
| 3 | 5.25-inch external drive bay for optional drives (optical drive shown) |

**NOTE:** The drive configuration on your computer may be different than the drive configuration shown above.

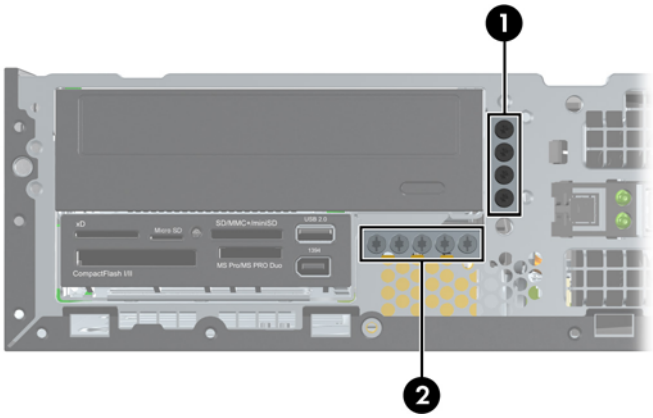
To verify the type, size, and capacity of the storage devices installed in the computer, run Computer Setup.

## Installing and Removing Drives

When installing additional drives, follow these guidelines:

- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0.
- Connect a SATA optical drive to the white SATA connector on the system board labeled SATA1.
- Connect devices in order of SATA0, SATA1, then SATA2
- Connect an optional eSATA adapter cable to the black ESATA connector on the system board.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA. If the media card reader has a 1394 port, connect the 1394 cable to the 1394 PCI card.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You must install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws for the external drive bays (five 6-32 standard screws and four M3 metric screws), installed in the front of the chassis, under the front bezel. The 6-32 standard screws are required for a secondary hard drive. All other drives (except the primary hard drive) use M3 metric screws. The HP-supplied metric screws are black and the HP-supplied standard screws are silver. If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting guide screws from the old hard drive and install them in the new hard drive.

**Figure 6-25** Extra Guide Screw Locations




| No. | Guide Screw | Device |
|---|---|---|
| 1 | Black M3 Metric Screws | All Drives (except hard drives) |
| 2 | Silver 6-32 Standard Screws | Secondary Hard Drive |

There are at total of five extra silver 6-32 standard screws. Four are used as guide screws for a secondary hard drive. The fifth is used for bezel security (see Front Bezel Security on page 80 for more information).

△ **CAUTION:** To prevent loss of work and damage to the computer or drive:

If you are inserting or removing a drive, shut down the operating system properly, turn off the computer, and unplug the power cord. Do not remove a drive while the computer is on or in standby mode.

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

Handle a drive carefully; do not drop it.

Do not use excessive force when inserting a drive.

Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

If a drive must be mailed, place the drive in a bubble-pack mailer or other protective packaging and label the package “Fragile: Handle With Care.”

## System Board Drive Connections

Refer to the following illustration and table to identify the system board drive connectors.

**Figure 6-26** System Board Drive Connections

**Table 6-4 System Board Drive Connections**

| No. | System Board Connector | System Board Label | Color |
|---|---|---|---|
| 1 | Media Card Reader | MEDIA | black |
| 2 | SATA0 | SATA0 | dark blue |
| 3 | SATA1 | SATA1 | white |
| 4 | SATA2 | SATA2 | light blue |
| 5 | eSATA | ESATA | black |

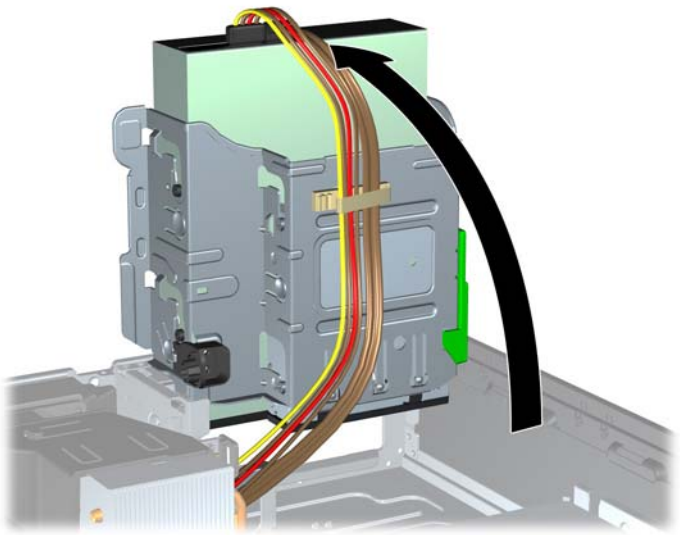
## Removing an External 5.25-inch Drive

△ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

To remove a 5.25-inch external drive:

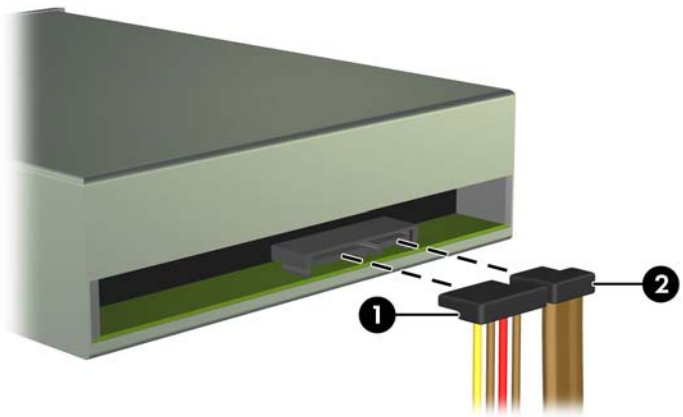
1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. If the computer is on a stand, remove the computer from the stand.
3. Remove the access panel (Computer Access Panel on page 95).
4. Rotate the drive cage to its upright position.

**Figure 6-27** Rotating the Drive Cage Up



5. If removing an optical drive, disconnect the power cable **(1)** and data cable **(2)** from the rear of the optical drive.

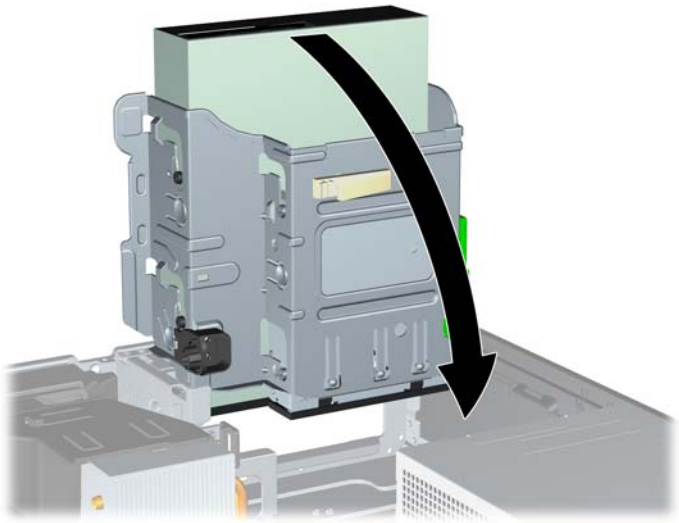
**Figure 6-28** Disconnecting the Power and Data Cables



6. Rotate the drive cage back down to its normal position.

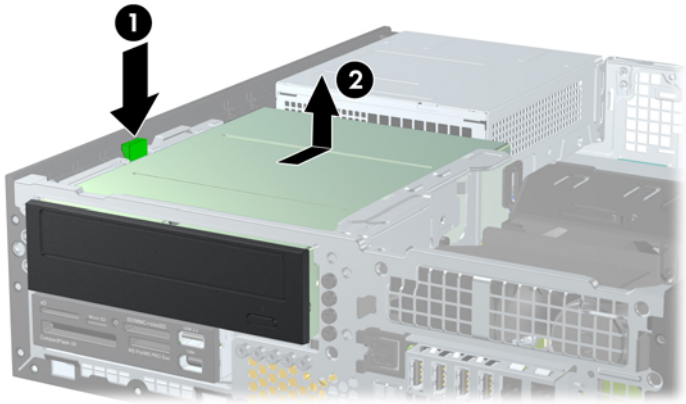
△ **CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 6-29** Rotating the Drive Cage Down



7. Press down on the green drive retainer button located on the left side of the drive to disengage the drive from the drive cage **(1)**. While pressing the drive retainer button, slide the drive back until it stops, then lift it up and out of the drive cage **(2)**.

**Figure 6-30** Removing the 5.25-inch Drive




**NOTE:** To replace the drive, reverse the removal procedure. When replacing a drive, transfer the four guide screws from the old drive to the new one.

## Installing an Optical Drive into the 5.25-inch Drive Bay

To install an optional 5.25-inch optical drive:

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. If the computer is on a stand, remove the computer from the stand.
3. Remove the access panel (Computer Access Panel on page 95).

4. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See Bezel Blanks on page 97 for more information.

5. Install four M3 metric guide screws in the lower holes on each side of the drive. HP has provided four extra M3 metric guide screws on the front of the chassis, under the front bezel. The M3 metric guide screws are black. Refer to Installing and Removing Drives on page 110 for an illustration of the extra M3 metric guide screws location.

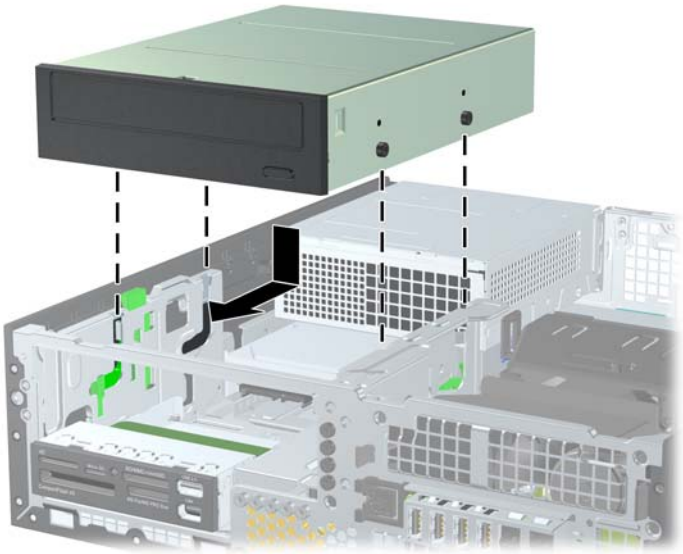
△ **CAUTION:** Use only 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.

**NOTE:** When replacing the drive, transfer the four M3 metric guide screws from the old drive to the new one.

**Figure 6-31** Installing Guide Screws in the Optical Drive

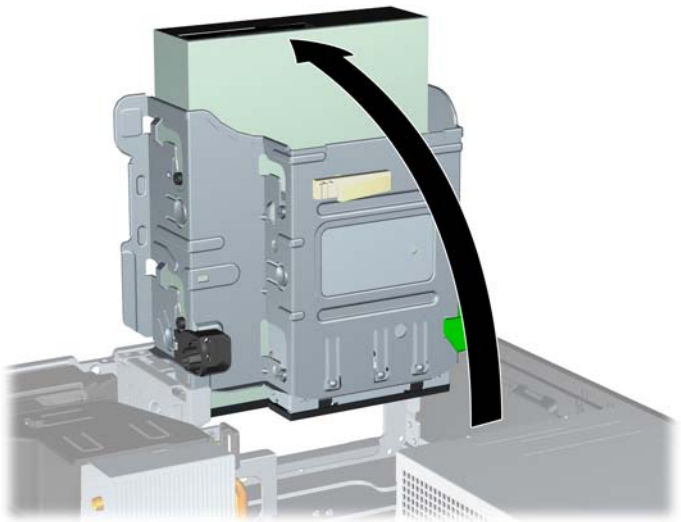
6. Position the guide screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it locks into place.

**Figure 6-32** Installing the Optical Drive



7. Rotate the drive cage to its upright position.

**Figure 6-33** Rotating the Drive Cage Up



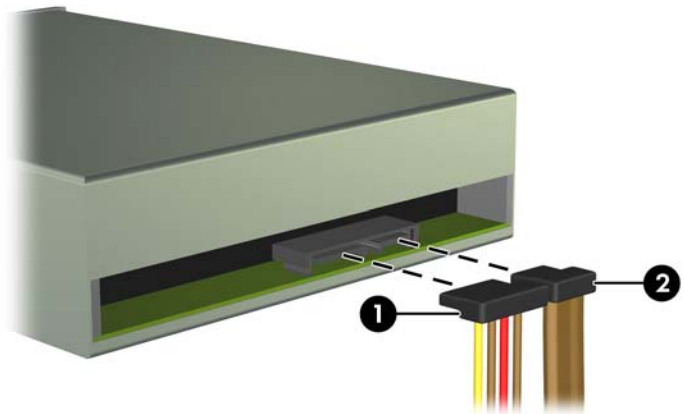
8. Connect the SATA data cable to the white system board connector labeled SATA1.

9. Route the data cable through the cable guides.

△ **CAUTION:** There are two cable guides that keep the data cable from being pinched by the drive cage when raising or lowering it. One is located on the bottom side of the drive cage. The other is located on the chassis frame under the drive cage. Ensure that the data cable is routed through these guides before connecting it to the optical drive.

10. Connect the power cable **(1)** and data cable **(2)** to the rear of the optical drive.

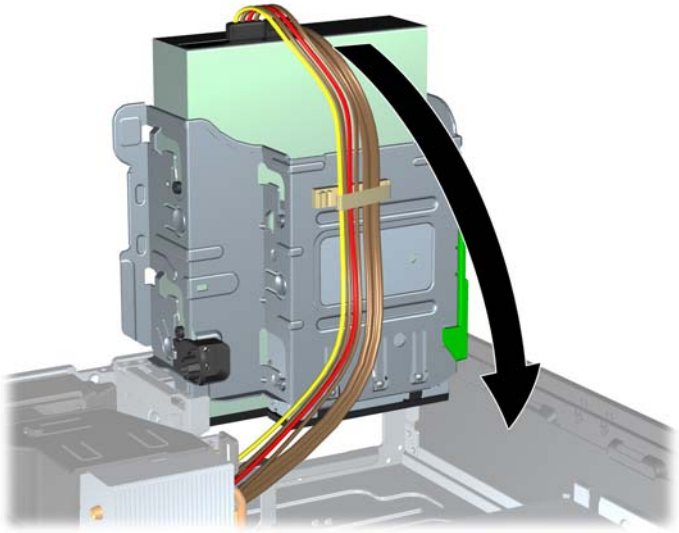
**Figure 6-34** Connecting the Power and Data Cables



11. Rotate the drive cage back down to its normal position.

△ **CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 6-35** Rotating the Drive Cage Down



12. Replace the access panel.
13. If the computer was on a stand, replace the stand.
14. Reconnect the power cord and turn on the computer.
15. Lock any security devices that were disengaged when the access panel was removed.

The system automatically recognizes the drive and reconfigures the computer.

## Removing an External 3.5-inch Drive

△ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

The 3.5-inch drive is located underneath the 5.25-inch drive. You must remove the external 5.25-inch drive before removing the external 3.5-inch drive.

1. Follow the procedure in Removing an External 5.25-inch Drive on page 112 to remove the 5.25-inch drive and access the 3.5-inch drive.

△ **CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

2. Disconnect the drive cables from the rear of the drive, or, if you are removing a media card reader, disconnect the USB and 1394 cables from the system board as indicated in the following illustrations.

**NOTE:** On some models, the media card reader does not include a 1394 port or cable.

**Figure 6-36** Disconnecting the Media Card Reader USB Cable

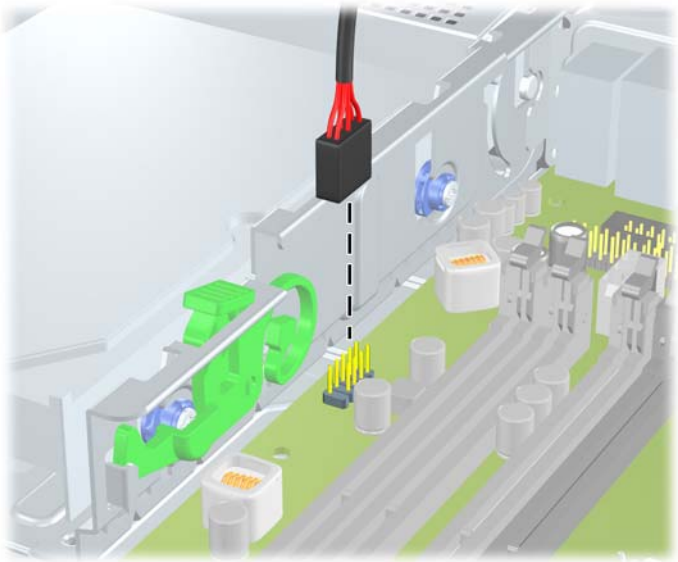
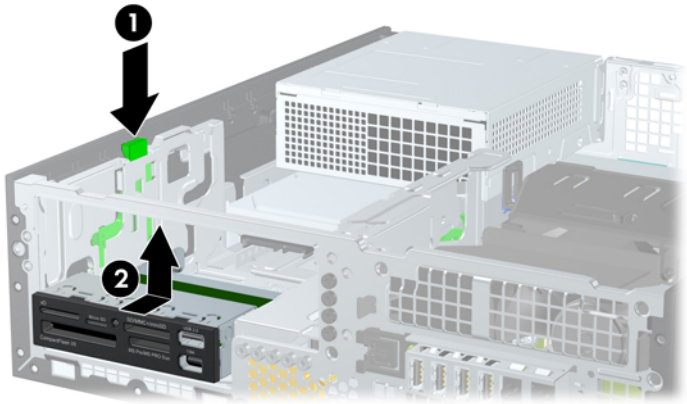


**Figure 6-37** Disconnecting the Media Card Reader 1394 Cable

3. Press down on the green drive retainer button located on the left side of the drive to disengage the drive from the drive cage **(1)**. While pressing the drive retainer button, slide the drive back until it stops, then lift it up and out of the drive cage **(2)**.

**Figure 6-38** Removing a 3.5-inch Drive (Media Card Reader Shown)




**NOTE:** To replace the 3.5-inch drive, reverse the removal procedure.

When replacing a 3.5-inch drive, transfer the four guide screws from the old drive to the new one.

## Installing a Drive into the 3.5-inch External Drive Bay

The 3.5-inch bay is located underneath the 5.25-inch drive. To install a drive into the 3.5-inch bay:

**NOTE:** Install guide screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra guide screws for the external drive bays (four 6-32 standard screws and four M3 metric screws), installed in the front of the chassis, under the front bezel. A secondary hard drive uses 6-32 standard screws. All other drives (except the primary hard drive) use M3 metric screws. The HP-supplied M3 metric screws are black and the HP-supplied 6-32 standard screws are silver. Refer to Installing and Removing Drives on page 110 for illustrations of the guide screw locations.

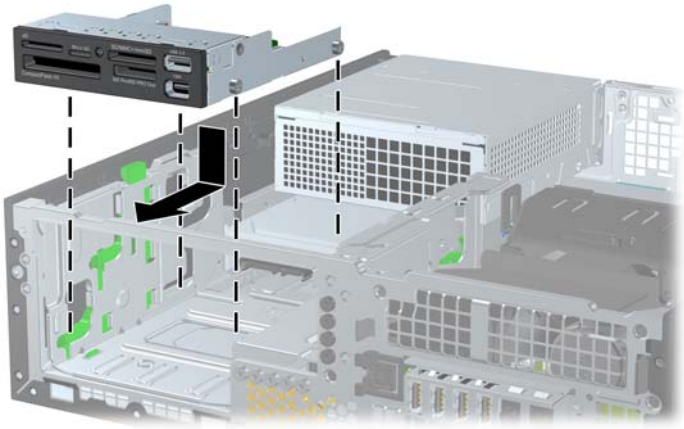
1. Follow the procedure in Removing an External 5.25-inch Drive on page 112 to remove the 5.25-inch drive and access the 3.5-inch drive bay.

**CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

2. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See Bezel Blanks on page 97 for more information.

3. Position the guide screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it locks into place.

**Figure 6-39** Installing a Drive into the 3.5-inch Drive Bay (Media Card Reader Shown)



4. Connect the appropriate drive cables:

   **a.** If installing a second hard drive, connect the power and data cables to the rear of the drive and connect the other end of the data cable to the next available (unpopulated) SATA connector on the system board by following the numbered sequence of the connectors.

   **b.** If installing a media card reader, connect the USB cable from the media card reader to the USB connector on the system board labeled MEDIA. If the media card reader includes a 1394 port, connect the 1394 cable to the 1394 PCI card.

   **NOTE:** Refer to System Board Drive Connections on page 111 for an illustration of the system board drive connectors.

5. Replace the 5.25-inch drive.
6. Replace the front bezel and access panel.
7. If the computer was on a stand, replace the stand.
8. Reconnect the power cord and turn on the computer.
9. Lock any security devices that were disengaged when the access panel was removed.

## Removing and Replacing the Primary 3.5-inch Internal SATA Hard Drive

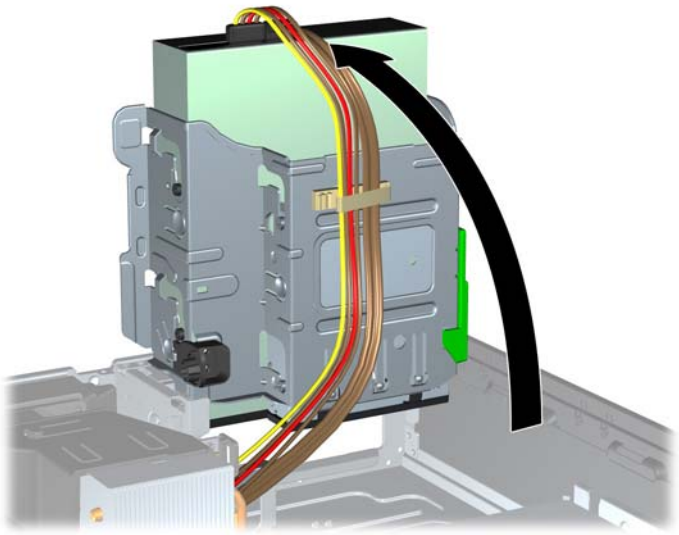
**NOTE:** The system does not support Parallel ATA (PATA) hard drives.

Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

The preinstalled 3.5-inch hard drive is located under the power supply. To remove and replace the hard drive:

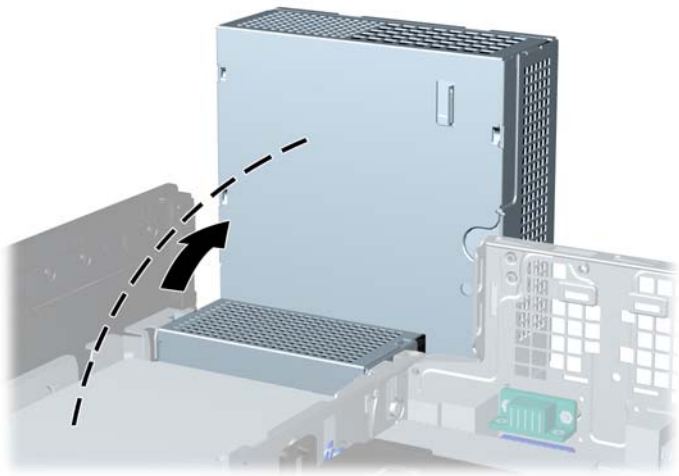
1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. If the computer is on a stand, remove the computer from the stand.
3. Remove the access panel (Computer Access Panel on page 95).
4. Rotate the drive cage for external drives to its upright position.

**Figure 6-40** Rotating the Drive Cage Up



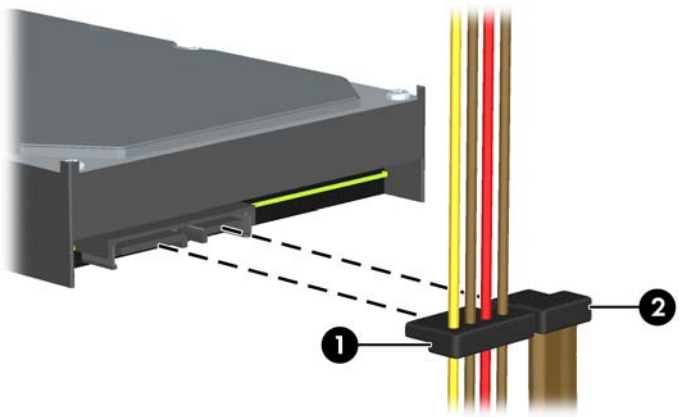
5. Rotate the power supply to its upright position. The hard drive is located beneath the power supply.

**Figure 6-41** Raising the Power Supply



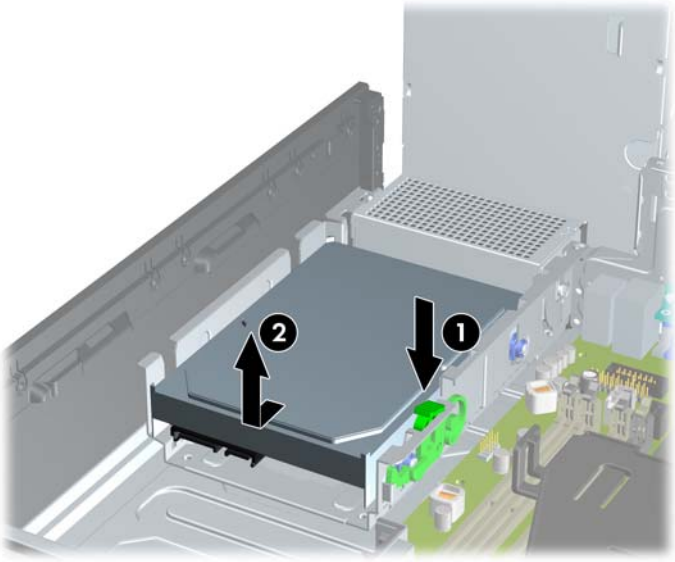
6. Disconnect the power cable **(1)** and data cable **(2)** from the back of the hard drive.

**Figure 6-42** Disconnecting the Hard Drive Power Cable and Data Cable



7. Press down on the green release latch next to the hard drive **(1)**. While holding the latch down, slide the drive forward until it stops, then lift the drive up and out of the bay **(2)**.

**Figure 6-43** Removing the Hard Drive

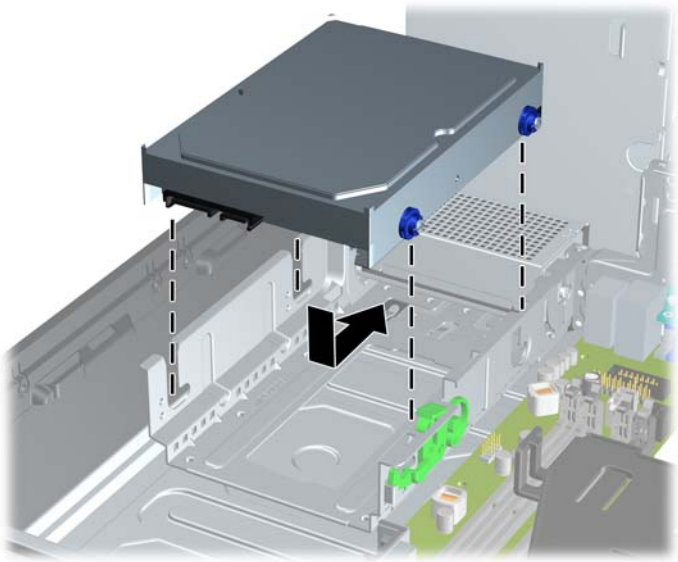



8. To install a hard drive, you must transfer the silver and blue isolation mounting guide screws from the old hard drive to the new hard drive.

**Figure 6-44** Installing Hard Drive Guide Screws

9. Align the guide screws with the slots on the chassis drive cage, press the hard drive down into the bay, then slide it back until it stops and locks in place.

**Figure 6-45** Installing the Hard Drive



10. Connect the power and data cables to the back of the hard drive.

**NOTE:** When replacing the primary hard drive, be sure to route the SATA and power cables through the cable guide on the bottom of the chassis frame behind the hard drive.

If the system has only one SATA hard drive, the data cable must be connected to the dark blue connector labeled SATA0 on the system board to avoid any hard drive performance problems.

11. Rotate the drive cage for external drives and the power supply down to their normal positions.
12. Replace the access panel.
13. If the computer was on a stand, replace the stand.
14. Reconnect the power cord and turn on the computer.
15. Lock any security devices that were disengaged when the access panel was removed.

## Removing and Replacing a Removable 3.5-inch SATA Hard Drive

Some models are equipped with a Removable SATA Hard Drive Enclosure in the 5.25-inch external drive bay. The hard drive is housed in a carrier that can be quickly and easily removed from the drive bay. To remove and replace a drive in the carrier:

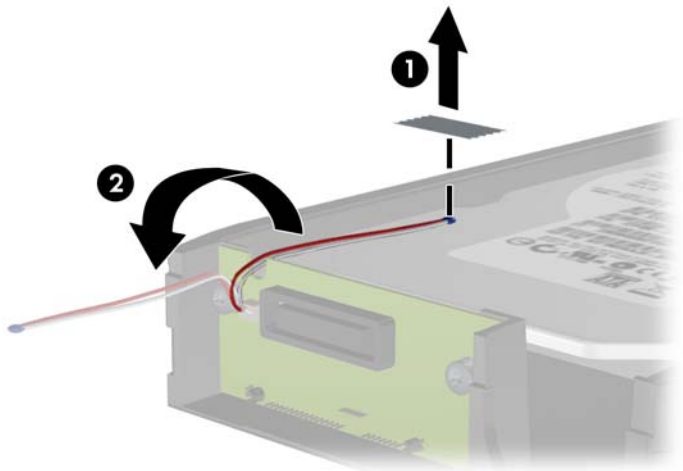
**NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

1. Unlock the hard drive carrier with the key provided and slide the carrier out of the enclosure.
2. Remove the screw from the rear of the carrier **(1)** and slide the top cover off the carrier **(2)**.

**Figure 6-46** Removing the Carrier Cover

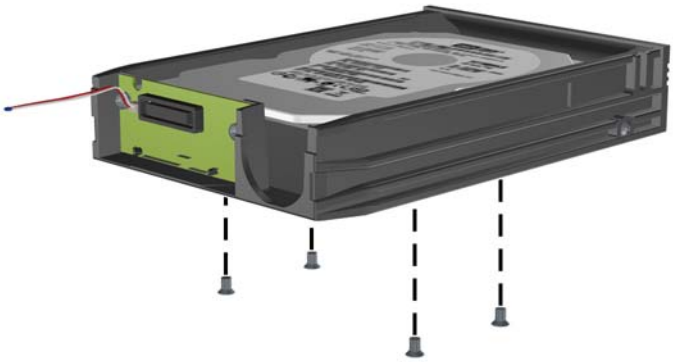

3. Remove the adhesive strip that secures the thermal sensor to the top of the hard drive **(1)** and move the thermal sensor away from the carrier **(2)**.

**Figure 6-47** Removing the Thermal Sensor



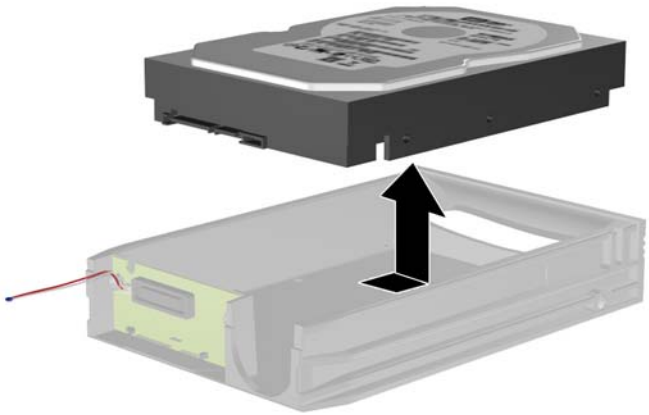
4. Remove the four screws from the bottom of the hard drive carrier.

**Figure 6-48** Removing the Security Screws



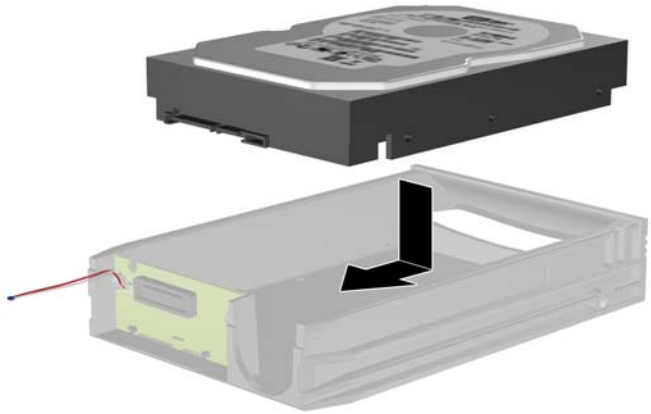
5. Slide the hard drive back to disconnect it from the carrier then lift it up and out of the carrier.

**Figure 6-49** Removing the Hard Drive



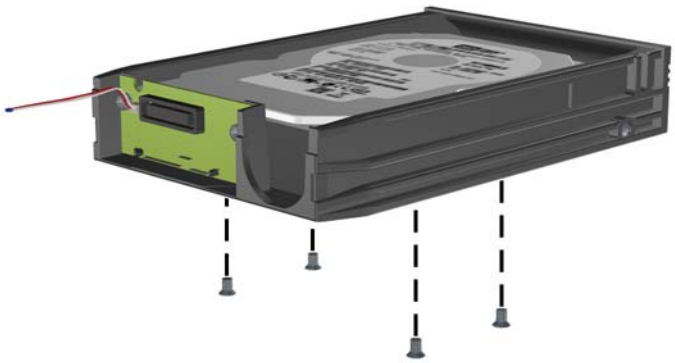
6. Place the new hard drive in the carrier then slide the hard drive back so that it seats in the SATA connector on the carrier's circuit board. Be sure the connector on the hard drive is pressed all the way into the connector on the carrier's circuit board.

**Figure 6-50** Replacing the Hard Drive



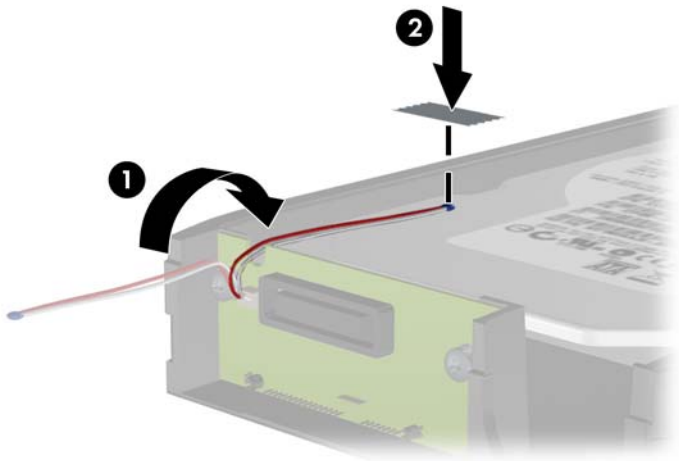
7. Replace the four screws in the bottom of the carrier to hold the drive securely in place.

**Figure 6-51** Replacing the Security Screws



8. Place the thermal sensor on top of the hard drive in a position that does not cover the label **(1)** and attach the thermal sensor to the top of the hard drive with the adhesive strip **(2)**.

**Figure 6-52** Replacing the Thermal Sensor




9. Slide the cover on the carrier **(1)** and replace the screw on the rear of the carrier to secure the cover in place **(2)**.

**Figure 6-53** Replacing the Carrier Cover


10. Slide the hard drive carrier into the enclosure on the computer and lock it with the key provided.

**NOTE:** The carrier must be locked for power to be supplied to the hard drive.

# Baffle

The baffle sits between the front fan and the heat sink.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Lift the baffle straight up out of the chassis.

**Figure 6-54** Removing the baffle

To install the baffle, reverse the removal procedure.

# Front Fan Assembly

The front fan assembly is attached to the front of the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Remove the front bezel (Front Bezel on page 96).
4. Remove the baffle (Baffle on page 128).
5. Disconnect the fan cable from the red/brown system board connector labeled CHFAN1.
6. Press the two tabs (one of left, one on bottom) that secure the fan assembly to the front of the chassis.

**Figure 6-55** Removing the front fan

7. Pull the assembly toward the rear of the unit, and then lift it out of the chassis.

To install the front fan, reverse the removal procedure. Be sure to orient the air flow into the unit.

# Hood Sensor

The hood sensor is attached in a slot in the rear of the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Unplug the sensor cable from the white system board connected labeled HSENSE.
4. Slide the hood sensor straight out of the notch in the chassis.

**NOTE:** A flat blade screwdriver can be used to push the hood sensor out of the slot.

**Figure 6-56** Removing the hood sensor from the chassis fan

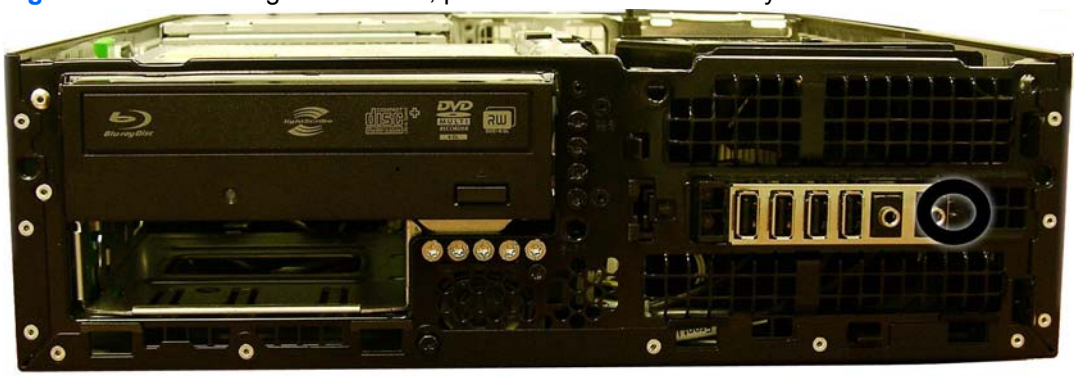
To install the hood sensor, reverse the removal procedure.

# Front I/O, Power Switch Assembly

The front I/O and power switch/LEDs are one assembly, attached to the front of the chassis. Push the assembly into the chassis to remove.

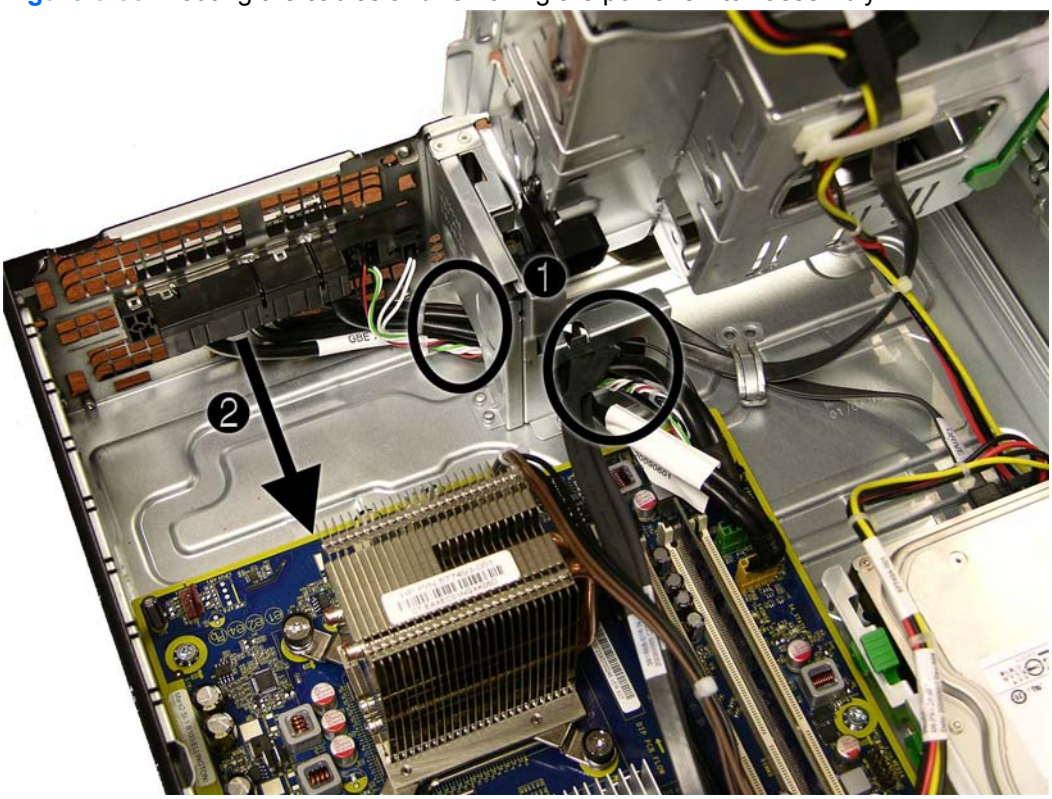
1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Remove the front bezel (Front Bezel on page 96).
4. Remove the chassis fan (Front Fan Assembly on page 129).
5. Rotate the drive cage to its upright position.
6. Disconnect the four cables from the system board as follows:
   - Yellow connector labeled FRNT USB1
   - Green connector labeled FRNT USB2
   - Blue connector labeled FRNT AUD
   - Black connector labeled PB/LED
7. Remove the screw that secures the assembly to the front of the chassis.

**Figure 6-57** Removing the front I/O, power switch/LED assembly screw



8. Route the cables through the slots beneath the drive cage **(1)**, pull the assembly (right side first) into the chassis **(2)**, and then remove the assembly from the computer.

**Figure 6-58** Routing the cables and removing the power switch assembly




To install the front I/O and power switch assembly, reverse the removal procedure.

**NOTE:** Be sure to correctly route the cables beneath the drive cage when reinstalling the assembly. Proper cable routing prevents damage to the cables and allows the drive cage to close properly.

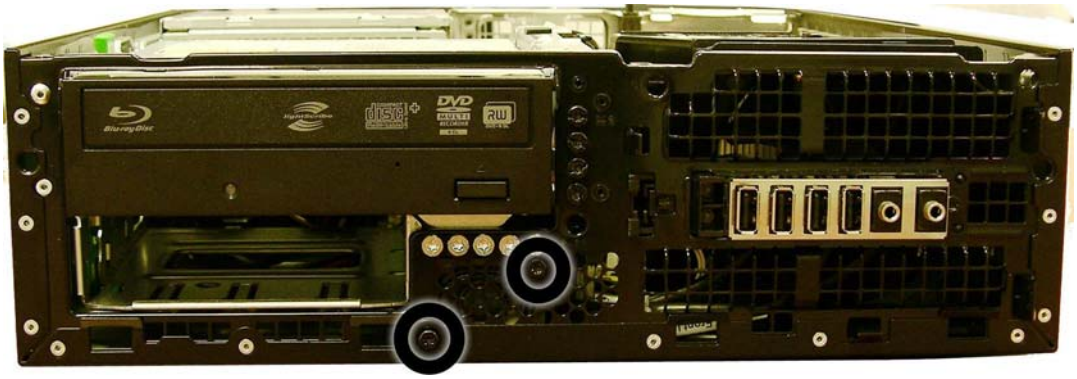
# Speaker

The speaker is attached to the front of the chassis under the rotating drive cage.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Remove the front bezel (Front Bezel on page 96).
4. Rotate the drive cage to its upright position.
5. Disconnect the speaker wire from the white system board labeled SPKR

6. Remove the two screws that secure the speaker to the chassis.

**Figure 6-59** Removing the speaker



7. Lift the speaker from the inside of the chassis to remove it.

To install the speaker, reverse the removal procedures.

# Heat sink

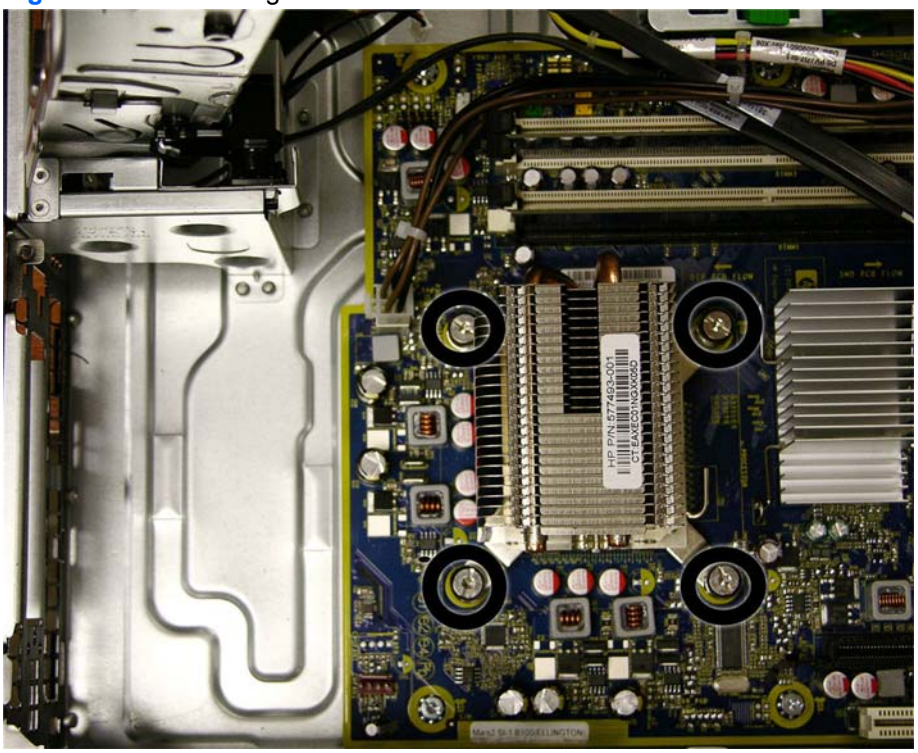
The heat sink is secured atop the processor with four captive Torx screws. The heat sink does not include a fan.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Remove the baffle (Baffle on page 128).
4. Remove the chassis fan (Front Fan Assembly on page 129).
5. Loosen the four captive screws that secure the heat sink to the system board tray.

△ **CAUTION:** Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

6. Lift the heat sink from atop the processor and set it on its side to keep from contaminating the work area with thermal grease.

**Figure 6-60** Removing the heat sink



When reinstalling the heat sink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor.

△ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor to avoid damage that could require replacing the system board.

Failure to install the baffle may cause the computer to overheat.

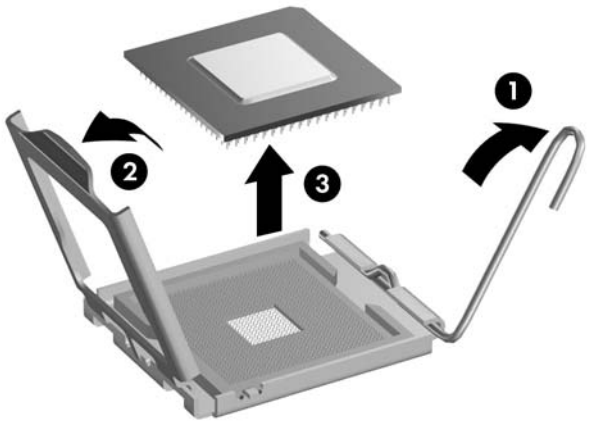
# Processor

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Remove the fan shroud (Baffle on page 128).
4. Remove the heat sink (Heat sink on page 134).
5. Rotate the locking lever to its full open position **(1)**.
6. Raise and rotate the microprocessor retainer to its fully open position **(2)**.
7. Carefully lift the processor from the socket **(3)**.

△ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.

**Figure 6-61** Removing the processor




To install a new processor:

1. Place the processor in its socket and close the retainer.
2. Secure the locking lever. If reusing the existing heat sink, go to step 3. If using a new heat sink, go to step 6.
3. If reusing the existing heat sink, clean the bottom of the heat sink with the alcohol pad provided in the spares kit.

△ **CAUTION:** Before reinstalling the heat sink you must clean the top of the processor and the bottom of the heat sink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.

4. Apply the thermal grease provided in the spares kit to the top of the processor and install the heat sink atop the processor.
5. Go to step 7.
6. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.
7. Secure the heat sink to the system board and system board tray with the four captive screws and attach the heat sink control cable to the system board.

△ **CAUTION:** heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

**NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: http://h18000.www1.hp.com/support/files.

# Power Supply

⚠ **WARNING!** To reduce potential safety issues, only the power supply provided with the computer, a replacement power supply provided by HP, or a power supply purchased as an accessory from HP should be used with the computer.

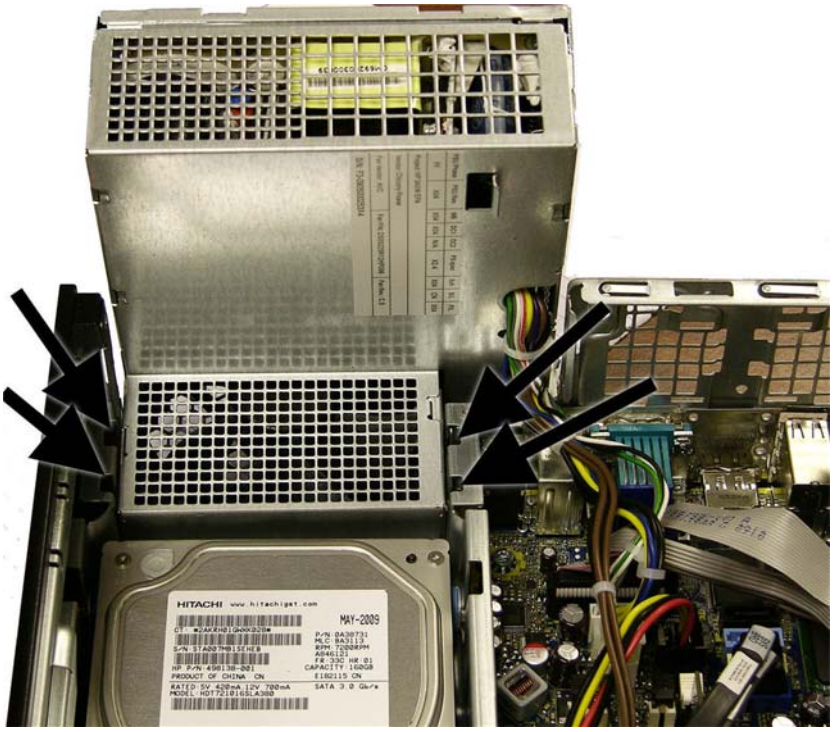
The rotating power supply is located at the rear of the chassis. It is held in place by a bracket – no screws are used.

⚠ **WARNING!** Voltage is always present on the system board when the computer is plugged into an active AC outlet. To avoid possible personal injury and damage to the equipment the power cord should be disconnected from the computer and/or the AC outlet before opening the computer.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. Rotate the drive cage up and disconnect the power cables from all of the drives.
4. Disconnect the power cables from the system board and drives.
5. Rotate the power supply to its full upright position.
6. Release the power supply cables from the cable retaining clip under the drive cage.

7. Pull the power supply forward until the posts on the power supply move forward in the power supply bracket, and then lift the power supply straight up and out of the chassis.

**Figure 6-62** Removing the power supply



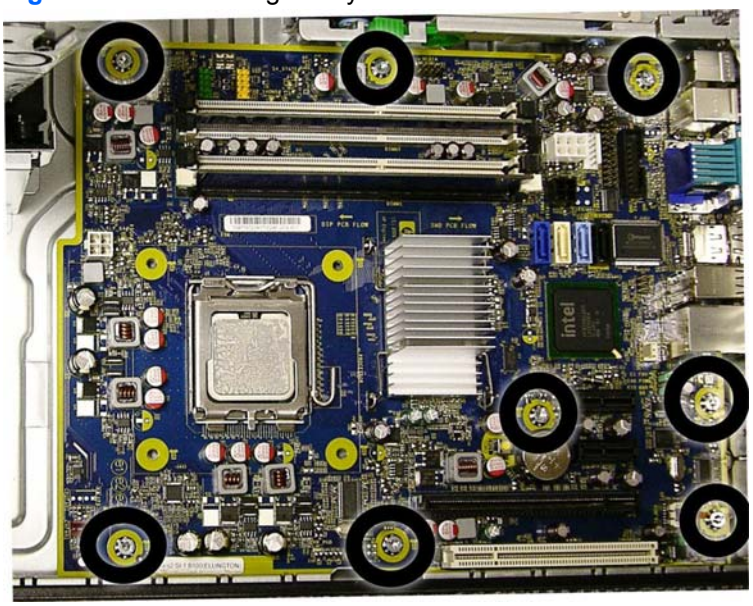

To install the power supply, reverse the removal procedure.

△ **CAUTION:** When installing the power supply cables, make sure they are properly positioned so they are not cut by the drive cage and are not pinched by the rotating power supply.

# System Board

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).
3. When replacing the system board, make sure the following components are removed from the defective system board and installed on the replacement system board:
   - Memory modules (seeInstalling Additional Memory on page 98)
   - Expansion cards (Expansion Cards on page 102)
   - Heat sink (Heat sink on page 134)
   - Processor (Processor on page 135)
4. Remove the baffle from the chassis (Baffle on page 128).
5. Remove the fan from the chassis (Front Fan Assembly on page 129).
6. Rotate the drive cage to its upright position.
7. Rotate the power supply to its full upright position.
8. Disconnect all data and power cables from the system board.
9. Disconnect the balance of the cables from the system board.
10. Remove the eight screws that secure the system board to the chassis.

**Figure 6-63** Removing the system board



11. Lift up the front of the system board, and then pull the system board forward, up, and out of the chassis.

To install the system board, reverse the removal procedure.

**NOTE:** When replacing the system board, you must also change the chassis serial number in the BIOS.

△ **CAUTION:** Before reinstalling the heat sink you must clean the top of the processor and the bottom of the heat sink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.

**CAUTION:** When reconnecting the cables it is important that they be positioned so they do not interfere with the rotation of the drive cage or power supply.

# Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

**NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

⚠ **WARNING!** This computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 140°F (60°C).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare designated for this product.

△ **CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to Computer Setup (F10) Utility on page 4 for information on backing up the CMOS settings.

**NOTE:** HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to http://www.hp.com/recycle.

△ **CAUTION:** Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Remove the access panel (Computer Access Panel on page 95).

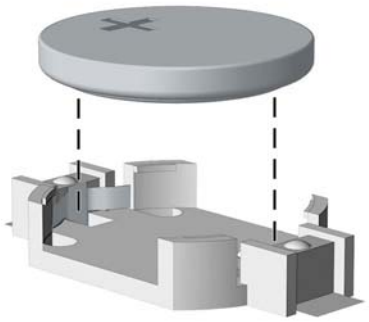
   **NOTE:** It may be necessary to remove an expansion card to gain access to the battery.

3. Locate the battery and battery holder on the system board.
4. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

## Type 1 Battery Holder

1. Lift the battery out of its holder.

   **Figure 6-64** Removing the battery from a type 1 holder

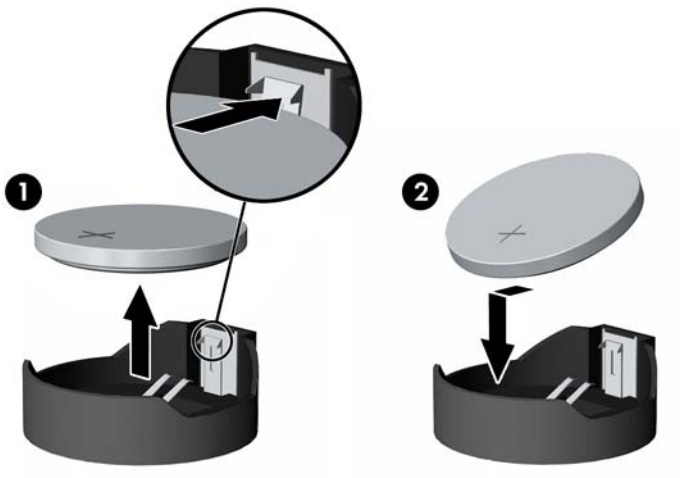


2. Slide the replacement battery into position, positive side up.
3. The battery holder automatically secures the battery in the proper position.
4. Replace the computer access panel.
5. Plug in the computer and turn on power to the computer.
6. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to Computer Setup (F10) Utility on page 4.

## Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery. When the battery pops up, lift it out **(1)**.
2. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up **(2)**. Push the other edge down until the clamp snaps over the other edge of the battery.

   **Figure 6-65** Removing the battery from a type 2 holder



3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to Computer Setup (F10) Utility on page 4.

## Type 3 Battery Holder

1. Pull back on the clip **(1)** that holds the battery in place, then remove the battery **(2)**.
2. Insert the new battery and position the clip back in place.

**Figure 6-66** Removing the battery from a type 3 holder

3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to Computer Setup (F10) Utility on page 4.

# Using the Small Form Factor Computer in a Tower Orientation

The Small Form Factor computer can be used in a tower orientation. The HP logo plate on the front bezel is adjustable for either desktop or tower orientation.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 87).
2. Orient the computer so that its right side is facing down and place the computer in the optional stand.

**Figure 6-67** Changing from Desktop to Tower Orientation

**NOTE:** To stabilize the computer in a tower orientation, HP recommends the use of the optional tower stand.

3. Lock any security devices that were disengaged when the access panel was removed.

**NOTE:** Ensure at least 10.2 centimeters (4 inches) of space on all sides of the computer remains clear and free of obstructions.

# 7 Removal and Replacement Procedures Ultra-Slim Desktop (USDT) Chassis

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

**NOTE:** Not all features listed in this guide are available on all computers.

## Preparation for Disassembly

See Identifying the Chassis, Routine Care, and Disassembly Preparation on page 21 for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer (Security Lock Provisions on page 144).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any compact disc from the computer.
5. Turn off the computer and any peripheral devices that are connected to it.

   **CAUTION:** Turn off the computer before disconnecting any cables.

   Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the “Standby,” or “Suspend” modes. The power cord should always be disconnected before servicing a unit.
6. Disconnect the power cord from the electrical outlet and then from the computer.
7. Disconnect all peripheral device cables from the computer.

   **NOTE:** During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

   **CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.
8. If the PC is mounted in the accessory mounting stand, remove it from the stand.

# Security Lock Provisions

**NOTE:** For information on data security features, refer to the *Desktop Management Guide* and the *HP ProtectTools Security Manager Guide* (some models) at http://www.hp.com.

The security locks displayed below and on the following pages can be used to secure the computer.

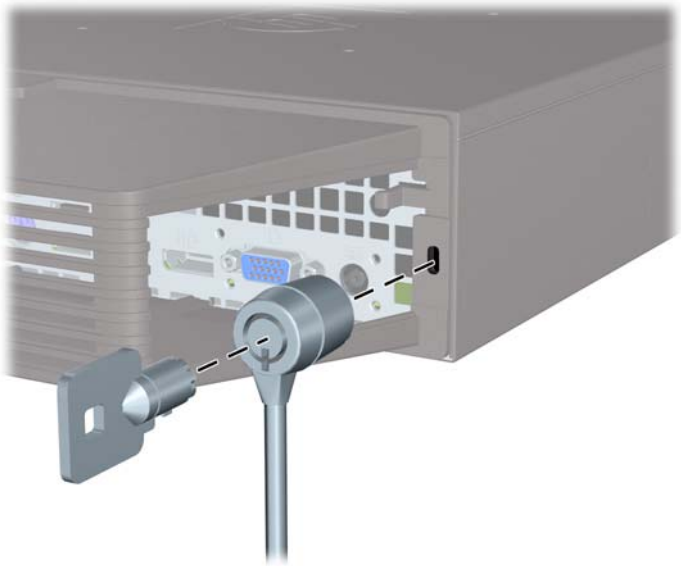
## Installing a Security Lock

### HP/Kensington MicroSaver Security Cable Lock

There are two cable lock slots on the rear of the computer. The slot next to the thumbscrew should be used when there is no port cover. The slot on the far right should be used when a port cover is installed.

**Figure 7-1** Installing a Cable Lock with No Port Cover

**Figure 7-2** Installing a Cable with a Port Cover Installed



## Padlock

**Figure 7-3** Installing a Padlock

## HP Business PC Security Lock

1. Fasten the security cable by looping it around a stationary object.

**Figure 7-4** Securing the Cable to a Fixed Object

2. Thread the keyboard and mouse cables through the lock.

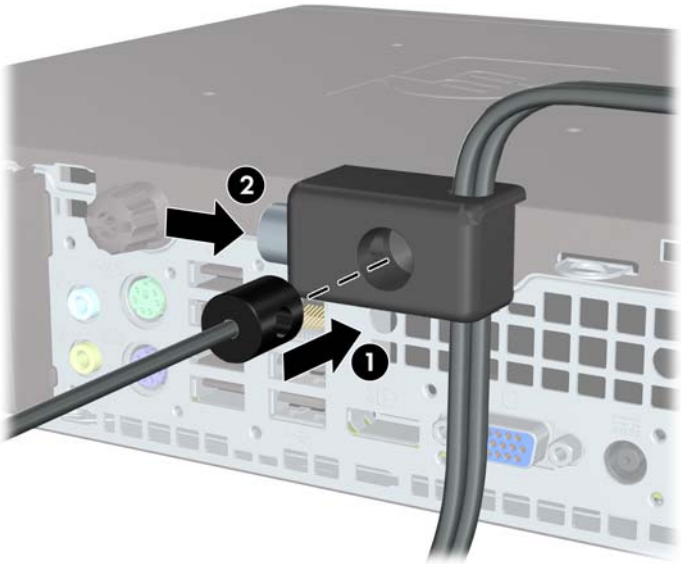
**Figure 7-5** Threading the Keyboard and Mouse Cables

3. Screw the lock to the chassis using the screw provided.

**Figure 7-6** Attaching the Lock to the Chassis

4. Insert the plug end of the security cable into the lock (1) and push the button in (2) to engage the lock. Use the key provided to disengage the lock.

**Figure 7-7** Engaging the Lock



## Front Bezel Security

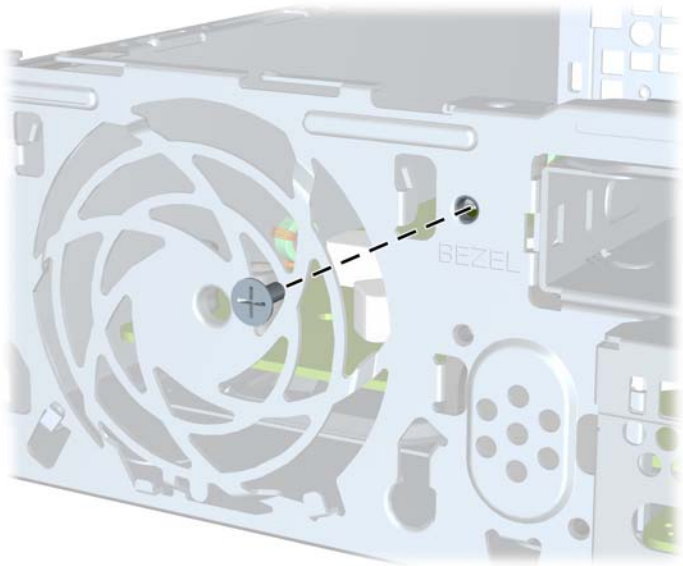
The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

△ **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the access panel and front bezel.
7. Remove the black screw on the front of the chassis behind the bezel. The screw is located next to the optical drive and is labeled "BEZEL."

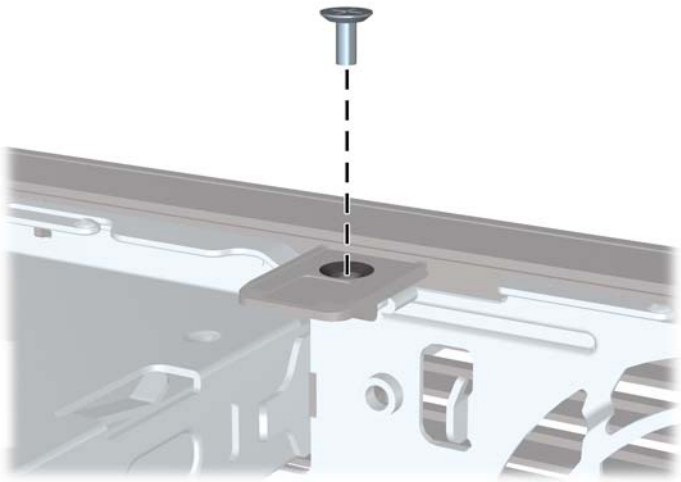
**Figure 7-8** Retrieving the Front Bezel Security Screw




8. Replace the front bezel.

9. Install the security screw through the middle front bezel release tab and into the chassis to secure the front bezel in place.

**Figure 7-9** Installing the Front Bezel Security Screw



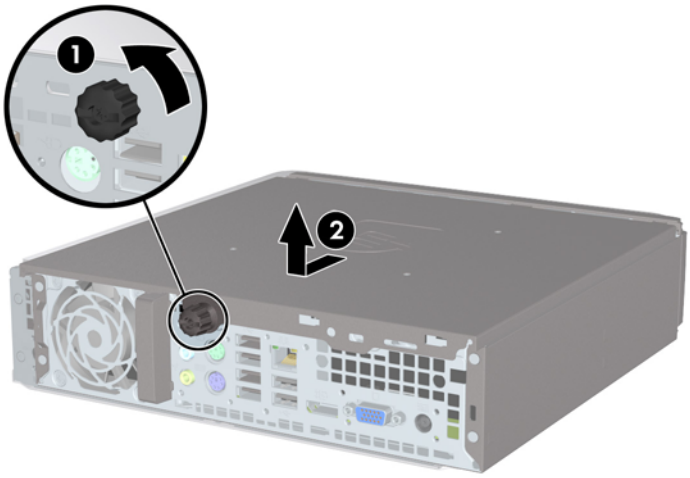
10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

# Computer Access Panel

To access internal components, you must remove the access panel:

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Loosen the thumbscrew on the rear of the computer **(1)**, slide the access panel toward the front of the computer, and then lift it off **(2)**.

**Figure 7-10** Removing the Computer Access Panel

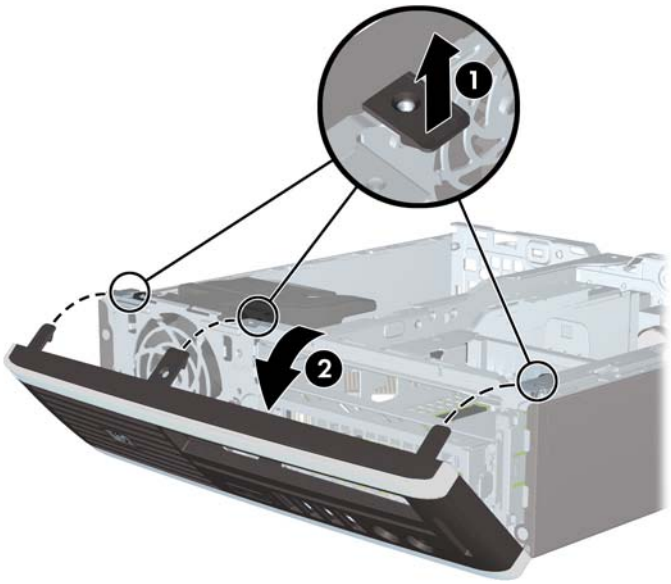



To install the access panel, reverse the removal procedure.

# Front Bezel

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Lift up the three tabs on the side of the bezel **(1)**, then rotate the bezel off the chassis **(2)**.

**Figure 7-11** Removing the Front Bezel




To install the front bezel, reverse the removal procedure.

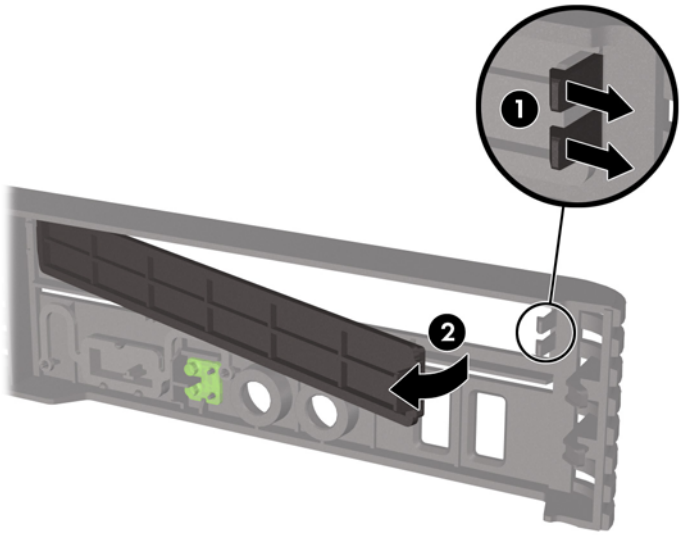
# Bezel Blank

On some models, there is a bezel blank covering the external drive bay that needs to be removed before installing a drive. To remove a bezel blank:

1. Remove the computer access panel (Computer Access Panel on page 150).
2. Remove the front bezel (Front Bezel on page 151).

3. Push the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel **(1)** and pull the bezel blank inwards to remove it **(2)**.

**Figure 7-12** Removing a Bezel Blank



# Installing Additional Memory

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) small outline dual inline memory modules (SODIMMs).

## SODIMMs

The memory sockets on the system board can be populated with up to two industry-standard SODIMMs. These memory sockets are populated with at least one preinstalled SODIMM. To achieve the maximum memory support, you can populate the system board with up to 8-GB of memory.

## DDR3-SDRAM SODIMMs

For proper system operation, the SODIMMs must be:

- industry-standard 204-pin
- unbuffered non-ECC PC3-8500 DDR3-1066 MHz-compliant or PC3-10600 DDR3-1333 MHz-compliant
- 1.5 volt DDR3-SDRAM SODIMMs

The DDR3-SDRAM SODIMMs must also:

- support CAS latency 7 DDR3 1066 MHz (7-7-7 timing) and CAS latency 9 DDR3 1333 MHz (9-9-9 timing)
- contain the mandatory Joint Electronic Device Engineering Council (JEDEC) specification

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided SODIMMS
- SODIMMs constructed with x8 and x16 devices; SODIMMs constructed with x4 SDRAM are not supported

**NOTE:** The system will not operate properly if you install unsupported SODIMMs.

## Populating SODIMM Sockets

There are two SODIMM sockets on the system board, with one socket per channel. The sockets are labeled XMM1 and XMM3. The XMM1 socket operates in memory channel A. The XMM3 socket operates in memory channel B.

**Figure 7-13** SODIMM Socket Locations

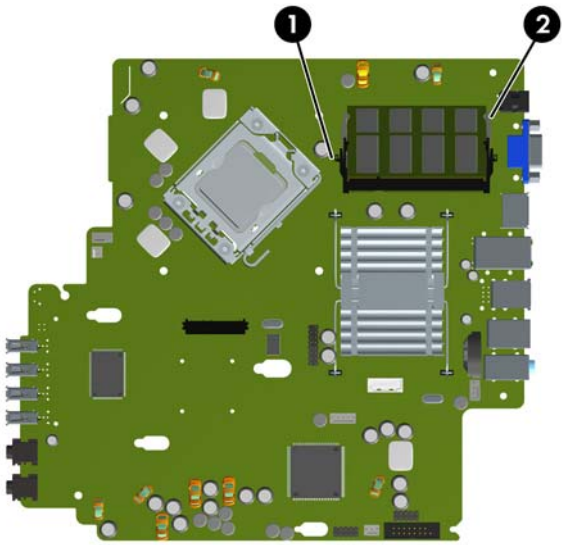



**Table 7-1 SODIMM Socket Locations**

| Item | Description | Socket Color |
|---|---|---|
| 1 | SODIMM1 socket, Channel A | Black |
| 2 | SODIMM3 socket, Channel B | White |

**NOTE:** A SODIMM must occupy the black XMM1 socket. Otherwise, the system will display a POST error message indicating that a memory module must be installed in the black socket.

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the SODIMMs are installed.

- The system will operate in single channel mode if the SODIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the memory capacity of the SODIMM in Channel A is equal to the memory capacity of the SODIMM in Channel B.
- The system will operate in flex mode if the memory capacity of the SODIMM in Channel A is not equal to the memory capacity of the SODIMM in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. If one channel will have more memory than the other, the larger amount should be assigned to channel A.
- In any mode, the maximum operational speed is determined by the slowest SODIMM in the system.

## Installing SODIMMs

△ **CAUTION:** You must disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

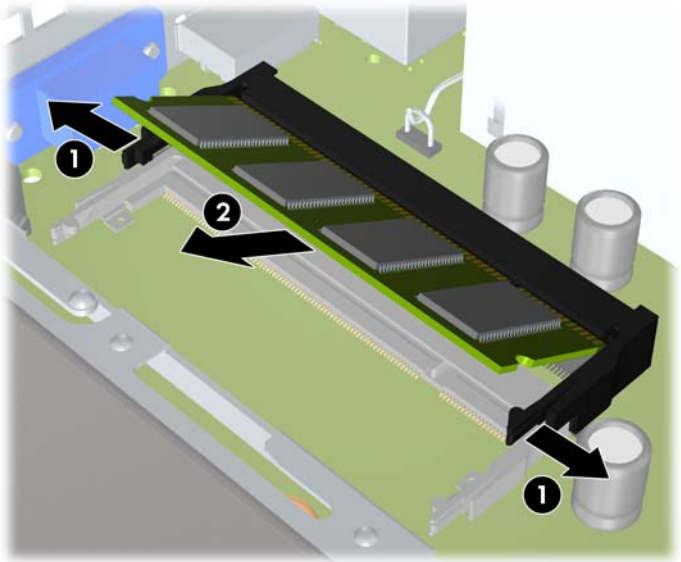
When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the access panel (Computer Access Panel on page 150).
3. Locate the memory module sockets on the system board.

⚠ **WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

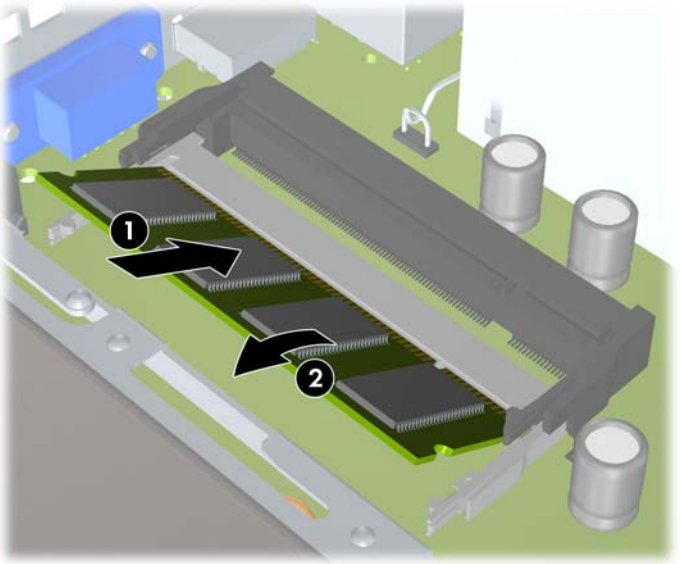
4. If you are adding a second SODIMM, remove the SODIMM from the top XMM1 socket to access the bottom XMM3 socket. Press outward on the two latches on each side of the SODIMM **(1)** then pull the SODIMM out of the socket **(2)**.

**Figure 7-14** Removing a SODIMM



5. Slide the new SODIMM into the socket at approximately a 30° angle **(1)** then press the SODIMM down **(2)** so that the latches lock it in place.

**Figure 7-15** Installing a SODIMM




**NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

A SODIMM must occupy the XMM1 (top) socket.

6. Replace the SODIMM in the DIMM1 socket if it was removed.
7. Replace the access panel.
8. If the computer was on a stand, replace the stand.
9. Reconnect the power cord and turn on the computer.
10. Lock any security devices that were disengaged when the computer cover or access panel was removed.

The computer automatically recognizes the additional memory when you turn on the computer.

# Cable Management

Always follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.
- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.
- Keep cables clear of sliding or moveable parts to prevent their being cut or crimped when the parts are moved.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.
- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

**Cable Connections**

System board connectors are color-coded to make it easier to find the proper connection.

System Board Connections

| System Board Connector | Connector Name | Connector Color | Description |
|---|---|---|---|
| P9 | CHFAN1 | Maroon | Front chassis fan |
| P11 | CHFAN2 | Brown | Rear chassis fan |
| P6 | SPRK | White | Internal speaker |
| P61 | SATA1 | White | Optical data |
| P125 | HSENSE | White | Hood sensor |
| P151 | BOOST | Black | ReadyBoost module |
| P160 | N/A | Black | Optical power |
| P160 | N/A | Black | Optical power |

# Replacing the Optical Drive

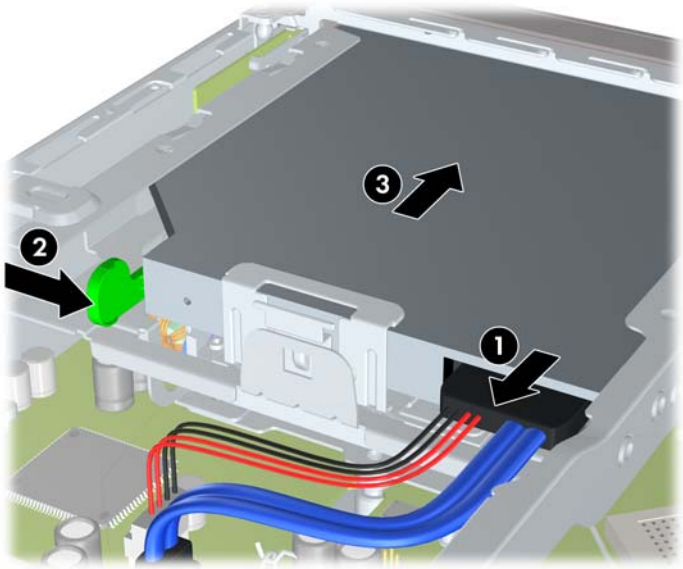
The Ultra-Slim Desktop uses a slimline Serial ATA (SATA) optical drive.

## Removing the Existing Optical Drive

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. If the computer is on a stand, remove the computer from the stand and lay the computer down.
3. Remove the computer access panel (Computer Access Panel on page 150).

4. Disconnect the cable on the rear of the optical drive **(1)**, push the green release latch on the right rear side of the drive toward the center of the drive **(2)**, then slide the drive forward and out of the bay through the front bezel **(3)**.

**Figure 7-16** Removing the Optical Drive

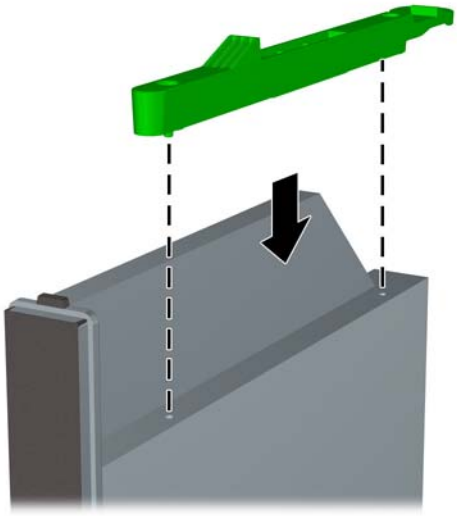


## Preparing the New Optical Drive

Before the new optical drive can be used, the release latch must be attached.

1. Peel the backing off the adhesive on the release latch.
2. Without allowing the release latch to touch the optical drive, carefully align the holes on the release latch with the pins on the side of the optical drive. Make sure the release latch is oriented properly.
3. Insert the pin at the front of the optical drive into the hole at the end of the release latch, and press firmly.
4. Insert the second pin, and press the entire release latch firmly to fasten the latch securely to the optical drive.

**Figure 7-17** Aligning the Release Latch

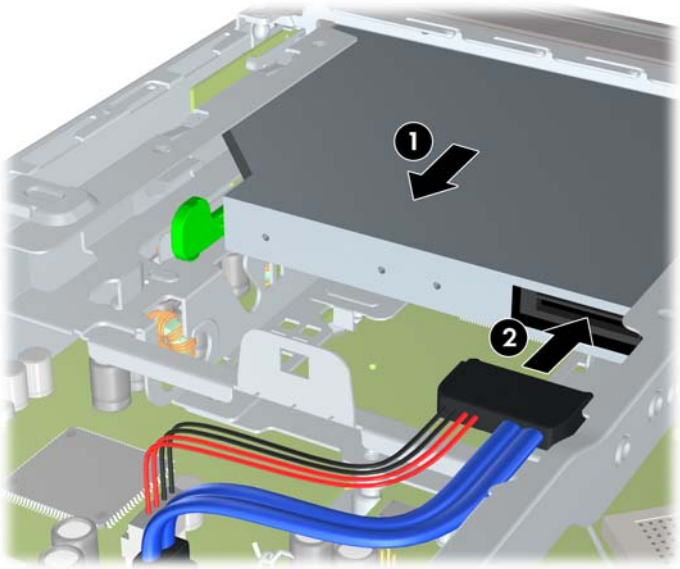


## Installing the New Optical Drive

**NOTE:** If you are installing an optical drive in a bay that did not previously have a drive in it, you must remove the access panel and the bezel blank covering the opening of the bay before proceeding. Follow the procedures in Computer Access Panel on page 150 and Bezel Blank on page 151.

1. Attach the release latch to the new optical drive. Refer to Preparing the New Optical Drive on page 159.
2. With the back of the optical drive facing the computer and the release latch on the inner side of the drive, align the drive with the opening in the front bezel.
3. Slide the optical drive through the front bezel all the way into the bay so that it locks in place **(1)**, then connect the cable to the rear of the drive **(2)**.

**Figure 7-18** Installing the Optical Drive



# Hard Drive

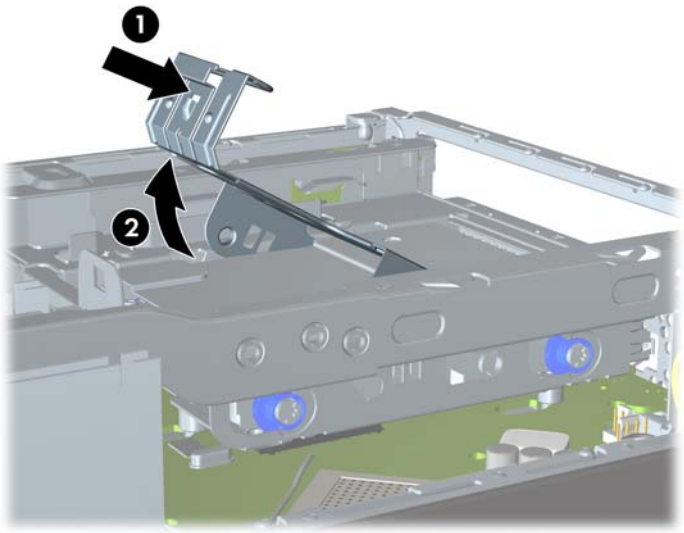
**NOTE:** The Ultra-Slim Desktop supports only 2.5-inch Serial ATA (SATA) internal hard drives; parallel ATA (PATA) internal hard drives are not supported.

Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

The 2.5-inch hard drive is enclosed in a carrier under the optical drive.

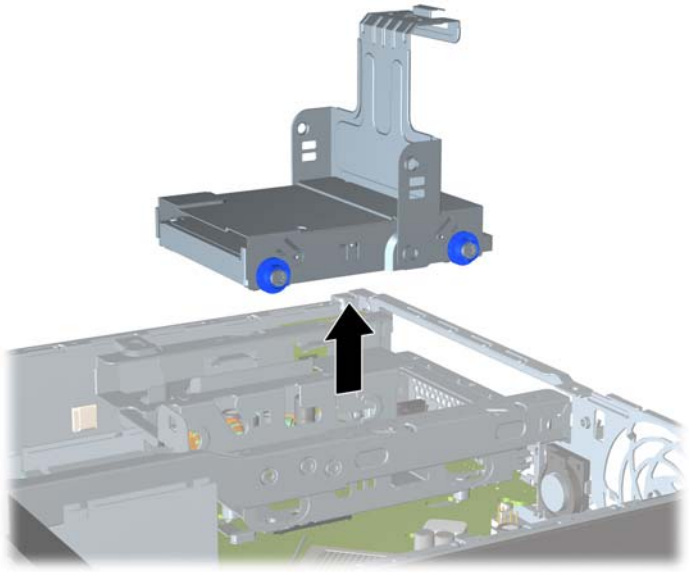
1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. If the computer is on a stand, remove the computer from the stand and lay the computer down.
3. Remove the computer access panel (Computer Access Panel on page 150).
4. Remove the optical drive. Refer to Removing the Existing Optical Drive on page 157 for instructions.
5. Press in the release latch on the left side of the hard drive carrier **(1)** then rotate the carrier handle to the right **(2)**.

**Figure 7-19** Unlocking the Hard Drive Carrier



6. Lift the hard drive carrier straight up and out of the chassis.

**Figure 7-20** Removing the Hard Drive Carrier

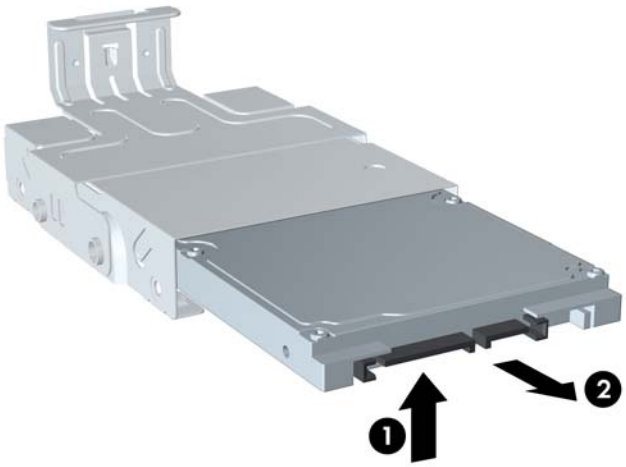


7. Remove the four guide screws from the sides of the hard drive carrier.

**Figure 7-21** Removing the Guide Screws

8. Lift the hard drive up to the top of the carrier **(1)** and slide the drive out of the carrier **(2)**.

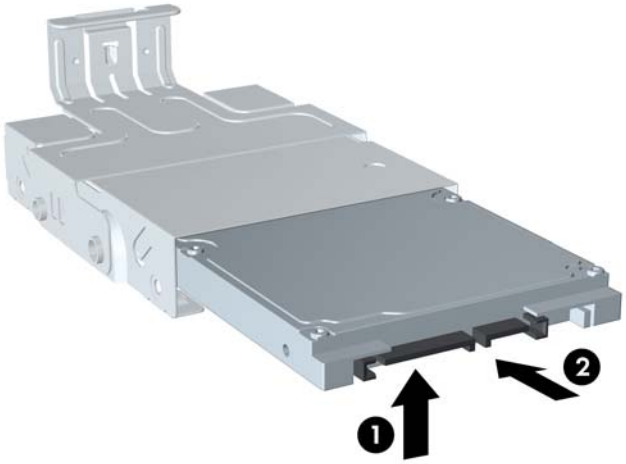
**Figure 7-22** Removing the Hard Drive from the Carrier



9. Position the hard drive so that the top of the hard drive is up against the top of the carrier **(1)** so that the circuit board on the bottom of the hard drive does not come in contact wit the tabs on the bottom of the carrier, then slide the new hard drive into the carrier **(2)**.

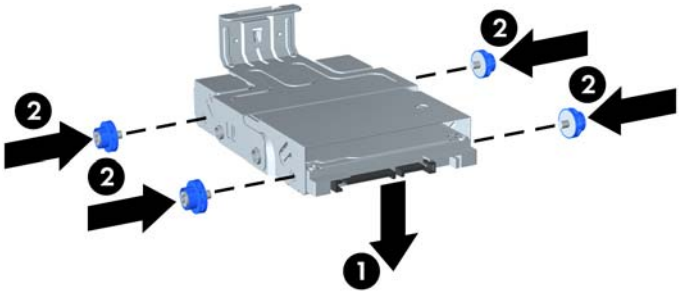
△ **CAUTION:** Do not allow the circuit board on the bottom of the hard drive to scrape along the tabs on the bottom of the carrier when sliding the hard drive into the carrier. Doing so can cause irreparable damage to the hard drive.

**Figure 7-23** Sliding the Hard Drive into the Carrier



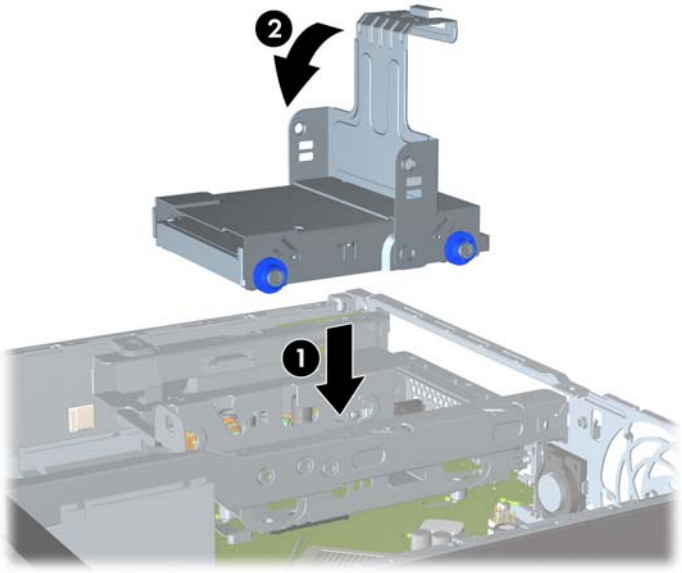

10. Set the hard drive down into the bottom of the carrier **(1)**, then replace the four guide screws on the sides of the carrier to secure the drive in the carrier **(2)**.

**Figure 7-24** Lowering the Hard Drive and Replacing the Guide Screws



11. To place the hard drive carrier back in the chassis, align the guide screws with the slots on the drive bay, drop the carrier straight down into the drive bay **(1)**, and press the handle on the carrier all the way down **(2)** so that the drive is properly seated and locked in place.

**Figure 7-25** Installing the Hard Drive Carrier




12. Replace the optical drive and reconnect the cable on the back of the optical drive.
13. Replace the computer access panel.
14. If the computer was on a stand, replace the stand.
15. Reconnect the power cord and turn on the computer.
16. Lock any security devices that were disengaged when the computer cover or access panel was removed.

**NOTE:** No configuration of the SATA hard drive is necessary; the computer automatically recognizes it the next time you turn on the computer.

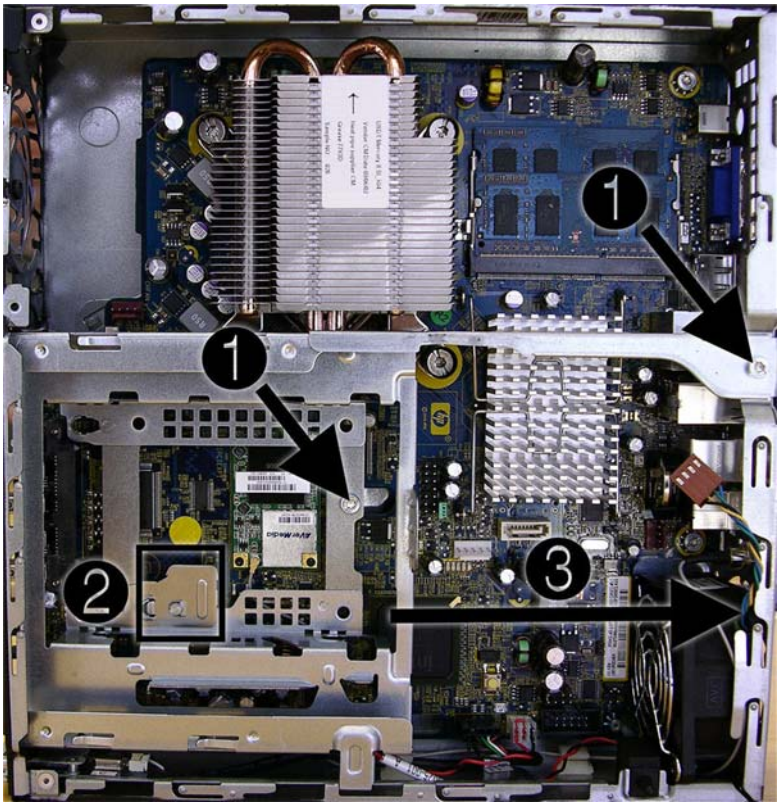
# Hard Drive Cage

The drive cage sits behind the USB ports on the front of the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the optical drive and connector (Removing the Existing Optical Drive on page 157).
4. Remove the hard drive (Hard Drive on page 161).

5. Remove the two Torx T15 screws that secure the cage to the chassis **(1)**, lift the tab **(2)** on the hard drive cage, slide the cage toward the rear of the unit **(3)**, and then pull the cage up and out of the chassis.

**Figure 7-26** Removing the hard drive cage




To install the hard drive cage, reverse the removal procedures.

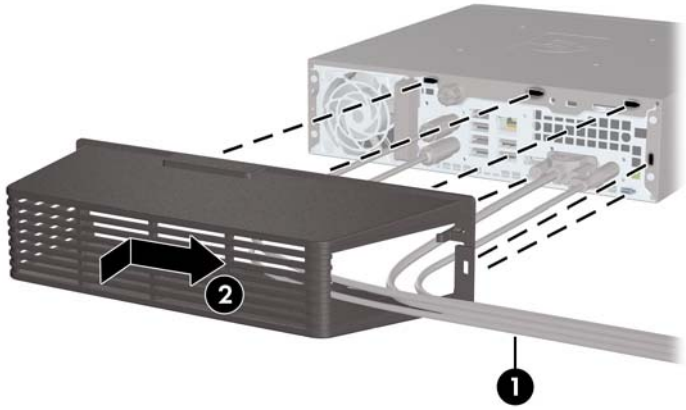
# Port Cover

An optional rear port cover is available for the computer.

To install the port cover:

1. Thread the cables through the bottom hole on the port cover **(1)** and connect the cables to the rear ports on the computer.
2. Insert the hooks on the port cover into the slots on the rear of the chassis, then slide the cover to the right to secure it in place **(2)**.

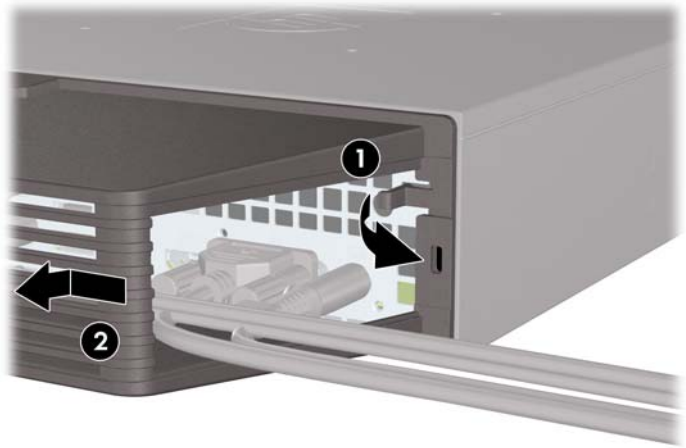
**Figure 7-27** Installing a Port Cover




**NOTE:** For security purposes, you can install an optional cable lock to the chassis that locks the port cover and secures the computer. See Installing a Security Lock on page 144.

The port cover is secured in place by a retention lever just inside the port cover opening. To remove the port cover, pull the lever back towards the port cover opening **(1)**, then slide the cover to the left and off the computer **(2)**.

**Figure 7-28** Removing a Port Cover

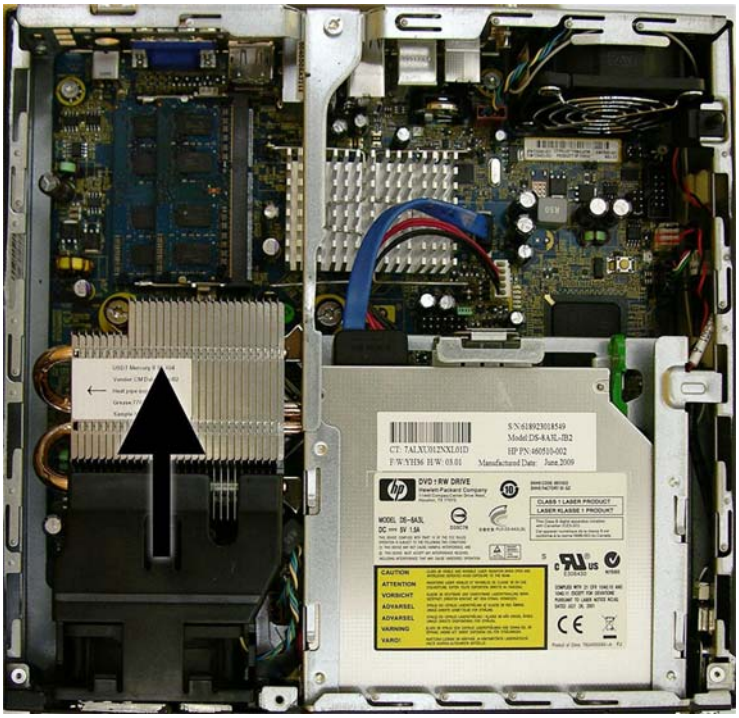


# Front Fan

The front fan sits against the front on the left side of the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Disconnect the fan control cable from the red system board connector labeled CHFAN.
4. Lift the fan straight up and out of the chassis.

**Figure 7-29** Removing the front fan



To install the front fan, reverse the removal procedure.

# Card Reader

The card reader is secured to the front right corner of the chassis.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the front bezel (Front Bezel on page 151).
4. Disconnect the cable from the black system board connector labeled MEDIA.
5. On the outside of the chassis, remove the one torx T15 screw that secures the card reader to the chassis.

**Figure 7-30** Removing the card reader


6. Pull the reader away from the front of the chassis while threading the cable through the slot in the front of the chassis.

To install the card reader, reverse the removal procedure.

# Speaker

The speaker is secured to the front of the chassis between the fan and the I/O ports.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the front bezel (Front Bezel on page 151).
4. Disconnect the speaker cable from the white system board connector labeled SPKR.
5. On the outside of the chassis, remove the two torx T8 screws that secure the speaker to the chassis, and then from the inside of the chassis, slide the speaker up to remove it.

**Figure 7-31** Removing the speaker

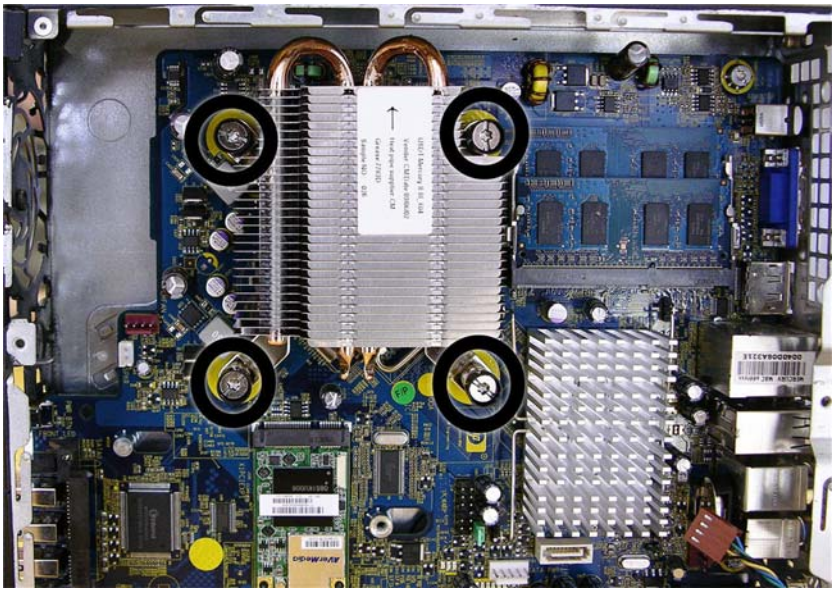
To install the speaker, reverse the removal procedure.

# Heat sink

The heat sink is secured by four Torx T15 screws. It does not have an attached fan.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Lift the front fan up and place it on top of the optical drive to access the front bezel release tabs. You do not need to disconnect the fan cable from the system board.
4. Loosen the four Torx T15 screws that secure the heat sink to the system board, and then lift the heat sink from the system board.

**Figure 7-32** Removing the heat sink



△ **CAUTION:** Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor to avoid damage that could require replacing the system board.

5. Lay the heat sink on its top in a safe area to prevent the thermal grease from contaminating the work surface.

If reusing the existing heat sink go to step 1.

If using a new heat sink, go to step 3.

1. If reusing the existing heat sink, clean bottom of the heat sink and apply the thermal grease provided in the spares kit to the top of the processor.
2. Position the heat sink atop the processor.
3. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.
4. Secure the heat sink to the system board and system board tray with the 4 captive screws and attach the heat sink control cable and the thermal sensor cable to the system board.

△ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

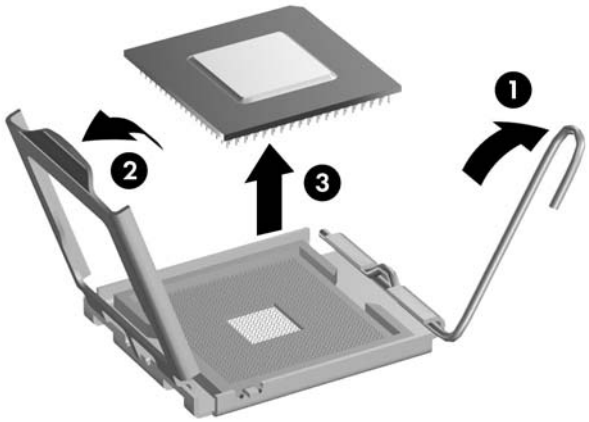
# Processor

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the heat sink (Heat sink on page 170).
4. Rotate the processor locking lever to its full open position **(1)**.
5. Raise and rotate the microprocessor retainer to its fully open position **(2)**.
6. Carefully lift the processor from the socket **(3)**.

△ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.

**Figure 7-33** Removing the processor




To install a new processor:

1. Place the processor in its socket and close the retainer.
2. Secure the locking lever.

   If reusing the existing heat sink, go to step 3.

   If using a new heat sink, go to step 5.
3. If reusing the existing heat sink, clean bottom of the heat sink and apply the thermal grease provided in the spares kit to the top of the processor.

4. Position the heat sink atop the processor.
5. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.
6. Secure the heat sink to the system board and system board tray with the 4 captive screws and attach the heat sink control cable to the system board.

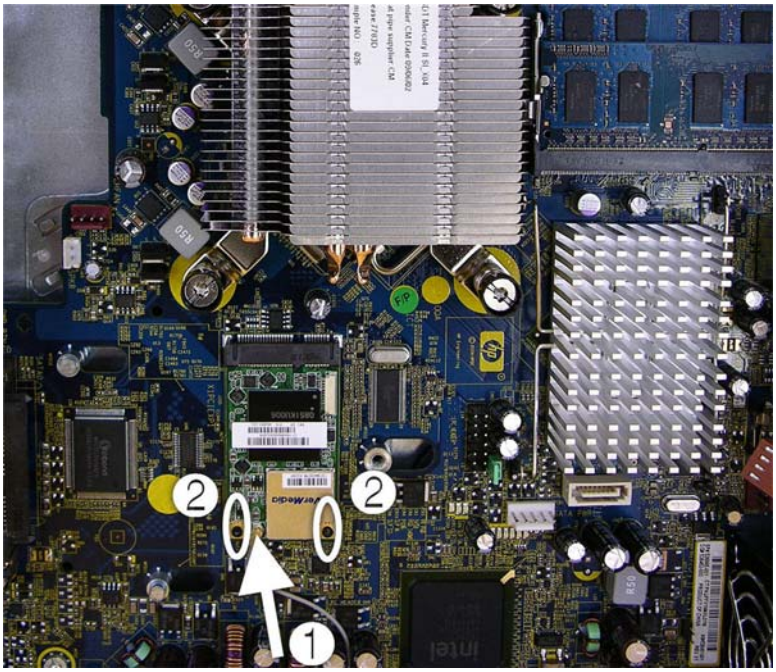
△ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

**NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: http://h18000.www1.hp.com/support/files.

# TV Tuner Module

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the optical drive (Removing the Existing Optical Drive on page 157).
4. Remove the hard drive (Hard Drive on page 161).
5. Remove the hard drive cage (Hard Drive Cage on page 164).
6. Remove the heat sink (Heat sink on page 170).
7. Disconnect the antenna cable from the connector on the TV tuner module.
8. Remove the two Torx T5 screws that secure the TV tuner module to the system board.
9. Lift the card to a 45 degree angle, and then remove the module from the connector by pulling it away at an angle.

**Figure 7-34** Removing the TV tuner module




To install the TV tuner module, reverse the removal procedure. Make sure the antenna cable is correctly routed over the speaker and in the clips mounted on the inside chassis wall.

# System Board

△ **CAUTION:** Be very careful when removing or replacing the system board to prevent damaging it.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the optical drive (Removing the Existing Optical Drive on page 157).

4. Remove the memory modules (Installing Additional Memory on page 153).
5. Remove the front fan (Front Fan on page 167).
6. Remove the hard drive (Hard Drive on page 161).
7. Remove the hard drive cage (Hard Drive Cage on page 164).
8. Remove the front I/O panel cage:
   a. Remove the screw from the right side of the cage that secures the I/O panel cage to the front of the chassis **(1)**.
   b. Press the tab on right side of the cage **(2)**, and then swing the right side of the cage away from the chassis to remove it **(3)**.

   **NOTE:** If the cage sticks and will not come loose, press down on the top of the panel near the tab while pressing the tab.

   **Figure 7-35** Removing the I/O panel cage


9. Remove the heat sink (Heat sink on page 170).
10. Disconnect all cables connected to the system board, noting their location for reinstallation.

11. Remove the three remaining screws that secure the system board to the chassis.

**Figure 7-36** Removing the system board

12. Slide system board toward the front of the unit until the rear connectors are clear of their slots in the chassis.

13. Lift the rear of the system board until it clears the chassis, and then remove the system board from the chassis.

To install the system board, reverse the removal procedure.

**NOTE:** When replacing the system board, you must also change the chassis serial number in the BIOS.

# Rear Fan

The rear fan is secured to the rear right corner of the chassis. You must remove the system board before you can remove the rear fan.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).

2. Remove the computer access panel (Computer Access Panel on page 150).

3. Remove the system board (TV Tuner Module on page 173).

4. Disconnect the fan control cable from the red/brown system board connector labeled CHFAN2.

5. From the outside of the chassis, remove the four Phillips screws that secure the fan to the chassis, then from the inside of the chassis, slide the fan forward and lift it up and out of the chassis.

**Figure 7-37** Removing the rear fan

To install the rear fan, reverse the removal procedure.

# Hood Sensor

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Remove the optical drive (Removing the Existing Optical Drive on page 157).
4. Unplug the hood sensor cable from the white system board connector labeled HSENSE and remove the cable from the white clip mounted on the inside chassis wall.
5. Slide the hood sensor into the chassis to remove it from its slot.

**Figure 7-38** Removing the hood sensor

To install the hood sensor, reverse the removal procedures.

# Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

**NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

**WARNING!** This computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 140°F (60°C).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare designated for this product.

**CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to Computer Setup (F10) Utility on page 4 for information on backing up the CMOS settings.

**NOTE:** HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to http://www.hp.com/recycle.

**CAUTION:** Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Remove the computer access panel (Computer Access Panel on page 150).
3. Pull back on the clip**(1)** that holds the battery in place, then remove the battery **(2)**.
4. Insert the new battery and position the clip back in place.

**Figure 7-39** Removing the battery

5. After the battery has been replaced, reverse the disassembly procedure.
6. Plug in the computer and turn on power to the computer.
7. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to the *Computer Setup (F10) Utility Guide*.

# Changing from Desktop to Tower Configuration

1. Prepare the computer for disassembly (Preparation for Disassembly on page 143).
2. Place the computer firmly down into the stand.

   **Figure 7-40** Placing the Computer on the Stand

3. Reconnect the external equipment, plug the power cord into a power outlet, and turn the computer on.
4. Lock any security devices that were disengaged when the computer cover or access panel was removed.

To change from the tower configuration to the desktop configuration, reverse the previous steps.

**NOTE:** An optional Quick Release mounting bracket is available from HP for mounting the computer to a wall, desk, or swing arm.

# Power Supply, External

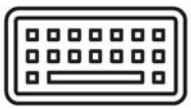
The USDT chassis uses an external power supply.

⚠ **WARNING!** To reduce potential safety issues, only the power supply provided with the computer, a replacement power supply provided by HP, or a power supply purchased as an accessory from HP should be used with the computer.

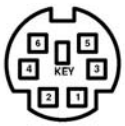
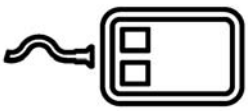
# A Connector Pin Assignments

This appendix contains the pin assignments for many computer and workstation connectors. Some of these connectors may not be used on the product being serviced.

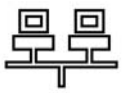
## Keyboard

| Connector and Icon | Pin | Signal |
|---|---|---|
|   | 1 | Data |
| | 2 | Unused |
| | 3 | Ground |
| | 4 | +5 VDC |
| | 5 | Clock |
| | 6 | Unused |

## Mouse

| Connector and Icon | Pin | Signal |
|---|---|---|
|   | 1 | Data |
| | 2 | Unused |
| | 3 | Ground |
| | 4 | +5 VDC |
| | 5 | Clock |
| | 6 | Unused |

## Ethernet BNC

| Connector and Icon | Pin | Signal |
|---|---|---|
|   | 1 | Data |
| | 2 | Ground |

# Ethernet RJ-45

| Connector and Icon | Pin | Signal |
|---|---|---|
|  | 1 | (+) Transmit Data |
| | 2 | (-) Transmit Data |
| | 3 | (+) Receive Data |
| | 4 | Unused |
| | 5 | Unused |
| | 6 | (-) Receive Data |
| | 7 | Unused |
| | 8 | Unused |

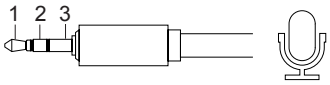
# Serial Interface, Powered and Non-Powered

| Connector and Icon | Pin | Signal |
|---|---|---|
|  | 1 | Carrier Detect (12V if powered) |
| | 2 | Receive Data |
| | 3 | Transmit Data |
| | 4 | Data Terminal Ready |
| | 5 | Signal Ground |
| | 6 | Data Set Ready |
| | 7 | Request to Send |
| | 8 | Clear to Send |
| | 9 | Ring Indicator (5V if powered) |

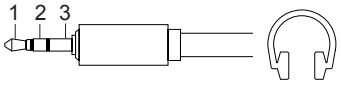
# USB

| Connector and Icon | Pin | Signal |
|---|---|---|
|  | 1 | +5 VDC |
| | 2 | - Data |
| | 3 | + Data |
| | 4 | Ground |

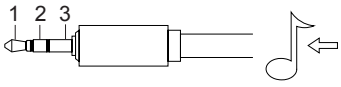
# Microphone

| Connector and Icon (1/8” miniphone) | Pin | Signal |
|---|---|---|
|  | 1 (Tip) | Audio_left |
| | 2 (Ring) | Power_Right |
| | 3 (Shield) | Audio_right |

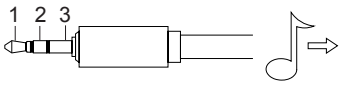
# Headphone

| Connector and Icon (1/8” miniphone) | Pin | Signal |
|---|---|---|
|  | 1 (Tip) | Audio_left |
| | 2 (Ring) | Power_Right |
| | 3 (Shield) | Ground |

# Line-in Audio

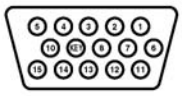
| Connector and Icon (1/8” miniphone) | Pin | Signal |
|---|---|---|
|  | 1 (Tip) | Audio_In_Left |
| | 2 (Ring) | Audio_In_Right |
| | 3 (Shield) | Ground |

# Line-out Audio

| Connector and Icon (1/8” miniphone) | Pin | Signal |
|---|---|---|
|  | 1 (Tip) | Audio_Out_Left |
| | 2 (Ring) | Audio_Out_Right |
| | 3 (Shield) | Ground |

# Monitor

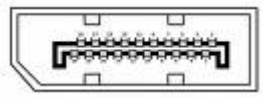
**Connector and Icon**



| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | Red Analog | 9 | +5V (fused) |
| 2 | Green Analog | 10 | Ground |
| 3 | Blue Analog | 11 | Not used |
| 4 | Not used | 12 | DDC Serial Data |
| 5 | Ground | 13 | Horizontal Sync |
| 6 | Ground | 14 | Vertical Sync |
| 7 | Ground | 15 | DDC Serial Clock |
| 8 | Ground | | |

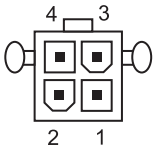
# DisplayPort

**Connector and Icon**

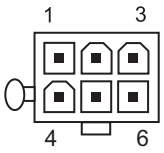


| TOP ROW | | | BOTTOM ROW | | |
|---|---|---|---|---|---|
| **Pin** | **Signal Type** | **Pin Name** | **Pin** | **Signal Type** | **Pin Name** |
| 1 | Ground | GND | 2 | In | Hot Plug Detect |
| 3 | Out | ML Lane 0 (p) | 4 | CONFIG | CONFIG 1 |
| 5 | Out | ML Lane 0 (n) | 6 | CONFIG | CONFIG 2 |
| 7 | Ground | GND | 8 | GND | GND |
| 9 | Out | ML Lane 1 (p) | 10 | Out | ML Lane 3 (p) |
| | Ground | | | | |
| 11 | Out | ML Lane 1 (n) | 12 | Out | ML Lane 3 (n) |
| 13 | Ground | GND | 14 | GND | GND |
| 15 | Out | ML Lane 2 (p) | 16 | I/O | AUX CH (p) |
| 17 | Out | ML Lane 2 (n) | 18 | I/O | AUX CH (n) |
| 19 | Ground | GND | 20 | PWR Out | DP_PWR |

# 4-Pin Power (for CPU)

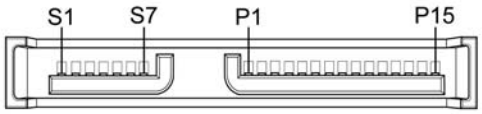
| Connector and Icon | Pin | Signal |
|---|---|---|
|  | 1 | GND |
| | 2 | GND |
| | 3 | +12V CPU |
| | 4 | -12V CPU |

# 6-Pin Power (for CPU) (CMT, SFF)

| Connector and Icon | Pin | Signal |
|---|---|---|
|  | 1 | GND |
| | 2 | GND |
| | 3 | GND |
| | 4 | 12V CPU |
| | 5 | 12V CPU |
| | 6 | +12V |

# SATA Data and Power

**Drive Connector**

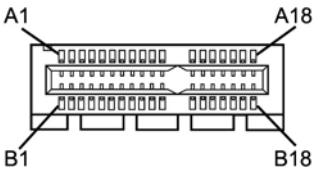



| Pin | Signal | Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|---|---|
| S1 | Ground | S2 | A+ | S3 | A- | S4 | Ground |
| S5 | B- | S6 | B+ | S7 | Ground | | |
| P1 | Ground | P2 | V 3.3 | P3 | V 3.3 | P4 | Ground |
| P5 | B- | P6 | Ground | P7 | V 5 | P8 | V 5 |
| P9 | V 5 | P10 | Ground | P11 | Reserved | P12 | Ground |
| P13 | V 12 | P14 | V12 | P15 | V 12 | | |

S = Data, P = Power

# PCI Express

**x1, x4, x8, and x16 PCI Express Connector**




**Pin A**

| Pin | Signal | Pin | Signal | Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PRSNT1 | 6 | JTAG3 | 11 | PERST# | 16 | PERp0 | 21 | PERp1 |
| 2 | +12V | 7 | JTAG4 | 12 | GND | 17 | PERn0 | 22 | PERn1 |
| 3 | +12V | 8 | JTAG5 | 13 | REFCLK+ | 18 | GND | 23 | GND |
| 4 | GND | 9 | +3.3V | 14 | REFCLK- | 19 | RSVD | 24 | GND |
| 5 | JTAG2 | 10 | +3.3V | 15 | GND | 20 | GND | 25 | PERp2 |
| 26 | PERn(2) | 31 | GND | 36 | PERn4 | 41 | GND | 46 | GND |
| 27 | GND | 32 | RSVD | 37 | GND | 42 | GND | 47 | PERp7 |
| 28 | GND | 33 | RSVD | 38 | GND | 43 | PERp6 | 48 | PERn7 |
| 29 | PERp3 | 34 | GND | 39 | PERp5 | 44 | PERn6 | 49 | GND |
| 30 | PERn3 | 35 | PERp4 | 40 | PERn5 | 45 | GND | 50 | RSVD |
| 51 | GND | 56 | PERp9 | 61 | PERn10 | 66 | GND | 71 | GND |
| 52 | PERp8 | 57 | PERn9 | 62 | GND | 67 | GND | 72 | PERp13 |
| 53 | PERN8 | 58 | GND | 63 | GND | 68 | PERp12 | 73 | PERn13 |
| 54 | GND | 59 | GND | 64 | PERp11 | 69 | PERn12 | 74 | GND |
| 55 | GND | 60 | PERp10 | 65 | PERn11 | 70 | GND | 75 | GND |
| 76 | PERp14 | 81 | PERn15 | | | | | | |
| 77 | PERn14 | 82 | GND | | | | | | |
| 78 | GND | | | | | | | | |
| 79 | GND | | | | | | | | |
| 80 | PERp15 | | | | | | | | |

**NOTE:** x1 PCI Express uses pins 1-18

x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

# PCI Express

**x1, x4, x8, and x16 PCI Express Connector**


**Pin B**

| Pin | Signal | Pin | Signal | Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|---|---|---|---|
| 1 | +12V | 6 | SMDAT | 11 | WAKE# | 16 | GND | 21 | GND |
| 2 | +12V | 7 | GND | 12 | RSVD | 17 | GND | 22 | GND |
| 3 | RSVD | 8 | +3.3 V | 13 | GND | 18 | GND | 23 | PETp2 |
| 4 | GND | 9 | JTAG1 | 14 | PETp0 | 19 | PETp1 | 24 | PETn2 |
| 5 | SMCLK | 10 | 3.3vAux | 15 | PETn0 | 20 | PETn1 | 25 | GND |
| 26 | GND | 31 | PRSNT2# | 36 | GND | 41 | PETp6 | 46 | PETn7 |
| 27 | PETp3 | 32 | GND | 37 | PETp5 | 42 | PRTn6 | 47 | GND |
| 28 | PETn3 | 33 | PETp4 | 38 | PETn5 | 43 | GND | 48 | PRSNT2# |
| 29 | GND | 34 | PETn4 | 39 | GND | 44 | GND | 49 | GND |
| 30 | RSVD | 35 | GND | 40 | GND | 45 | PETp7 | 50 | PETp8 |
| 51 | PETn8 | 56 | GND | 61 | GND | 66 | PETp12 | 71 | PETn13 |
| 52 | GND | 57 | GND | 62 | PETp11 | 67 | PETn12 | 72 | GND |
| 53 | GND | 58 | PETp10 | 63 | PETn11 | 68 | GND | 73 | GND |
| 54 | PETp9 | 59 | PETn10 | 64 | GND | 69 | GND | 74 | PETp14 |
| 55 | PETn9 | 60 | GND | 65 | GND | 70 | PETp13 | 75 | PETn14 |
| 76 | GND | 81 | PRSNT2# | | | | | | |
| 77 | GND | 82 | RSVD | | | | | | |
| 78 | PETp15 | | | | | | | | |
| 79 | PETn15 | | | | | | | | |
| 80 | GND | | | | | | | | |

**NOTE:** x1 PCI Express uses pins 1-18

x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

# B Power Cord Set Requirements

The power supplies on some computers have external power switches. The voltage select switch feature on the computer permits it to operate from any line voltage between 100-120 or 220-240 volts AC. Power supplies on those computers that do not have external power switches are equipped with internal switches that sense the incoming voltage and automatically switch to the proper voltage.

The power cord set received with the computer meets the requirements for use in the country where you purchased the equipment.

Power cord sets for use in other countries must meet the requirements of the country where you use the computer.

## General Requirements

The requirements listed below are applicable to all countries:

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 $mm_2$ or 18AWG, and the length of the cord must be between 1.8 m (6 feet) and 3.6 m (12 feet).

The power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

⚠ **WARNING!** Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.

## Japanese Power Cord Requirements

For use in Japan, use only the power cord received with this product.

△ **CAUTION:** Do not use the power cord received with this product on any other products.

# Country-Specific Requirements

Additional requirements specific to a country are shown in parentheses and explained below.

| Country | Accrediting Agency | Country | Accrediting Agency |
|---|---|---|---|
| Australia (1) | EANSW | Italy (1) | IMQ |
| Austria (1) | OVE | Japan (3) | METI |
| Belgium (1) | CEBC | Norway (1) | NEMKO |
| Canada (2) | CSA | Sweden (1) | SEMKO |
| Denmark (1) | DEMKO | Switzerland (1) | SEV |
| Finland (1) | SETI | United Kingdom (1) | BSI |
| France (1) | UTE | United States (2) | UL |
| Germany (1) | VDE | | |

1. The flexible cord must be Type HO5VV-F, 3-conductor, 0.75$mm_2$ conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.
3. Appliance coupler, flexible cord, and wall plug must bear a “T” mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 0.75 $mm_2$ conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

# C POST Error Messages

This appendix lists the error codes, error messages, and the various indicator light and audible sequences that you may encounter during Power-On Self-Test (POST) or computer restart, the probable source of the problem, and steps you can take to resolve the error condition.

POST Message Disabled suppresses most system messages during POST, such as memory count and non-error text messages. If a POST error occurs, the screen will display the error message. To manually switch to the POST Messages Enabled mode during POST, press any key (except F10, F11, or F12). The default mode is POST Message Disabled.

The speed at which the computer loads the operating system and the extent to which it is tested are determined by the POST mode selection.

Quick Boot is a fast startup process that does not run all of the system level tests, such as the memory test. Full Boot runs all of the ROM-based system tests and takes longer to complete.

Full Boot may also be enabled to run every 1 to 30 days on a regularly scheduled basis. To establish the schedule, reconfigure the computer to the Full Boot Every x Days mode, using Computer Setup.

**NOTE:** For more information on Computer Setup, see the *Computer Setup (F10) Utility Guide*.

# POST Numeric Codes and Text Messages

This section covers those POST errors that have numeric codes associated with them. The section also includes some text messages that may be encountered during POST.

**NOTE:** The computer will beep once after a POST text message is displayed on the screen.

**Table C-1 Numeric Codes and Text Messages**

| Control panel message | Description | Recommended action |
|---|---|---|
| 101-Option ROM Checksum Error | System ROM or expansion board option ROM checksum. | 1. Verify the correct ROM.<br>2. Flash the ROM if needed.<br>3. If an expansion board was recently added, remove it to see if the problem remains.<br>4. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>5. If the message disappears, there may be a problem with the expansion card.<br>6. Replace the system board. |
| 103-System Board Failure | DMA or timers. | 1. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>2. Remove expansion boards.<br>3. Replace the system board. |
| 110-Out of Memory Space for Option ROMs | Recently added PCI expansion card contains an option ROM too large to download during POST. | 1. If a PCI expansion card was recently added, remove it to see if the problem remains.<br>2. In Computer Setup, set **Advanced** > **Device Options** > **NIC PXE Option ROM Download** to **DISABLE** to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server. |
| 162-System Options Not Set | Configuration incorrect.<br><br>RTC (real-time clock) battery may need to be replaced. | Run Computer Setup and check the configuration in **Advanced** > **Onboard Devices**.<br><br>Reset the date and time under **Control Panel**. If the problem persists, replace the RTC battery. See the *Hardware Reference Guide* for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement. |

**Table C-1 Numeric Codes and Text Messages (continued)**

| Control panel message | Description | Recommended action |
|---|---|---|
| 163-Time & Date Not Set | Invalid time or date in configuration memory.<br><br>RTC (real-time clock) battery may need to be replaced. | Reset the date and time under **Control Panel** (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the *Hardware Reference Guide* for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement. |
| 163-Time & Date Not Set | CMOS jumper may not be properly installed. | Check for proper placement of the CMOS jumper if applicable. |
| 164-MemorySize Error | Memory amount has changed since the last boot (memory added or removed). | Press the F1 key to save the memory changes. |
| 164-MemorySize Error | Memory configuration incorrect. | 1. Run Computer Setup or Windows utilities.<br>2. Make sure the memory module(s) are installed properly.<br>3. If third-party memory has been added, test using HP-only memory.<br>4. Verify proper memory module type. |
| 201-Memory Error | RAM failure. | 1. Ensure memory modules are correctly installed.<br>2. Verify proper memory module type.<br>3. Remove and replace the identified faulty memory module(s).<br>4. If the error persists after replacing memory modules, replace the system board. |
| 213-Incompatible Memory Module in Memory Socket(s) X, X, ... | A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset. | 1. Verify proper memory module type.<br>2. Try another memory socket.<br>3. Replace DIMM with a module conforming to the SPD standard. |
| 214-DIMM Configuration Warning | Populated DIMM Configuration is not optimized. | Rearrange the DIMMs so that each channel has the same amount of memory. |
| 219-ECC Memory Module Detected ECC Modules not supported on this Platform | Recently added memory module(s) support ECC memory error correction. | 1. If additional memory was recently added, remove it to see if the problem remains.<br>2. Check product documentation for memory support information. |
| 301-Keyboard Error | Keyboard failure. | 1. Reconnect keyboard with computer turned off.<br>2. Check connector for bent or missing pins.<br>3. Ensure that none of the keys are depressed.<br>4. Replace keyboard. |

**Table C-1 Numeric Codes and Text Messages (continued)**

| Control panel message | Description | Recommended action |
|---|---|---|
| 303-Keyboard Controller Error | I/O board keyboard controller. | 1. Reconnect keyboard with computer turned off.<br>2. Replace the system board. |
| 304-Keyboard or System Unit Error | Keyboard failure. | 1. Reconnect the keyboard with computer turned off.<br>2. Ensure that none of the keys are depressed.<br>3. Replace the keyboard.<br>4. Replace the system board. |
| 501-Display Adapter Failure | Graphics display controller. | 1. Reseat the graphics card (if applicable).<br>2. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>3. Verify monitor is attached and turned on.<br>4. Replace the graphics card (if possible). |
| 510-Flash Screen Image Corrupted | Flash Screen image has errors. | Reflash the system ROM with the latest BIOS image. |
| 511-CPU, CPUA, or CPUB Fan not Detected | CPU fan is not connected or may have malfunctioned. | 1. Reseat CPU fan.<br>2. Reseat fan cable.<br>3. Replace CPU fan. |
| 512-Chassis, Rear Chassis, or Front Chassis Fan not Detected | Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned. | 1. Reseat chassis, rear chassis, or front chassis fan.<br>2. Reseat fan cable.<br>3. Replace chassis, rear chassis, or front chassis fan. |
| 514-CPU or Chassis Fan not Detected | CPU or chassis fan is not connected or may have malfunctioned. | 1. Reseat CPU or chassis fan.<br>2. Reseat fan cable.<br>3. Replace CPU or chassis fan. |
| 660-Display cache is detected unreliable | Integrated graphics controller display cache is not working properly and will be disabled. | Replace system board if minimal graphics degrading is an issue. |
| 912-Computer Cover Has Been Removed Since Last System Startup | Computer cover was removed since last system startup. | No action required. |
| 917-Front Audio Not Connected | Front audio harness has been detached or unseated from motherboard. | Reconnect or replace front audio harness. |
| 918-Front USB Not Connected | Front USB harness has been detached or unseated from motherboard. | Reconnect or replace front USB harness. |
| 921-Device in PCI Express slot failed to initialize | There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1. | Try rebooting the system. If the error reoccurs, the device may not work with this system |

**Table C-1 Numeric Codes and Text Messages (continued)**

| Control panel message | Description | Recommended action |
|---|---|---|
| 1151-Serial Port A Address Conflict Detected | Both external and internal serial ports are assigned to COM1. | 1. Remove any serial port expansion cards.<br>2. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>3. Reconfigure card resources and/or run Computer Setup or Windows utilities. |
| 1152-Serial Port B Address Conflict Detected | Both external and internal serial ports are assigned to COM2. | 1. Remove any serial port expansion cards.<br>2. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>3. Reconfigure card resources and/or run Computer Setup or Windows utilities. |
| 1155-Serial Port Address Conflict Detected | Both external and internal serial ports are assigned to same IRQ. | 1. Remove any serial port expansion cards.<br>2. Clear CMOS. (See Appendix B, Password Security and Resetting CMOS on page 243.)<br>3. Reconfigure card resources and/or run Computer Setup or Windows utilities. |
| 1720-SMART Hard Drive Detects Imminent Failure | Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.) | 1. Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under **Storage** > **DPS Self-test**.<br>2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.)<br>3. Back up contents and replace hard drive. |
| 1796-SATA Cabling Error | One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 connectors must be used before SATA 2 and SATA 3. | Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA 1, and SATA 2. |
| 1801-Microcode Patch Error | Processor is not supported by ROM BIOS. | 1. Upgrade BIOS to proper version.<br>2. Change the processor. |

**Table C-1 Numeric Codes and Text Messages (continued)**

| Control panel message | Description | Recommended action |
|---|---|---|
| 2200-PMM Allocation Error during MEBx Download | Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM. | 1. Reboot the computer.<br>2. Unplug the power cord, re-seat the memory modules, and reboot the computer.<br>3. If the memory configuration was recently changed, unplug the computer, restore the original memory configuration, and reboot the computer.<br>4. If the error persists, replace the system board. |
| 2201-MEBx Module did not checksum correctly | Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM. | 1. Reboot the computer.<br>2. Unplug the power cord, re-seat the memory modules, and reboot the computer.<br>3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.<br>4. If the error persists, replace the system board. |
| 2202-PMM Deallocation Error during MEBx cleanup | Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM. | 1. Reboot the computer.<br>2. Unplug the power cord, re-seat the memory modules, and reboot the computer.<br>3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.<br>4. If the error persists, replace the system board. |
| 2203-Setup error during MEBx execution | MEBx selection or exit resulted in a setup failure. | 1. Reboot the computer.<br>2. Unplug the power cord, re-seat the memory modules, and reboot the computer.<br>3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.<br>4. If the error persists, replace the system board. |

**Table C-1 Numeric Codes and Text Messages (continued)**

| Control panel message | Description | Recommended action |
|---|---|---|
| 2204-Inventory error during MEBx execution | BIOS information passed to the MEBx resulted in a failure. | 1. Reboot the computer.<br>2. If the error persists, update to the latest BIOS version.<br>3. If the error still persists, replace the system board. |
| 2205-Interface error during MEBx execution | MEBx operation experienced a hardware error during communication with ME. | 1. Reboot the computer.<br>2. If the error persists, update to the latest BIOS version.<br>3. If the error still persists, replace the system board. |
| 2211-Memory not configured correctly for proper MEBx execution. | DIMM1 is not installed. | Make sure there is a memory module in the black DIMM1 socket and that it is properly seated. |
| Invalid Electronic Serial Number | Electronic serial number is missing. | Enter the correct serial number in Computer Setup. |
| Network Server Mode Active and No Keyboard Attached | Keyboard failure while Network Server Mode enabled. | 1. Reconnect keyboard with computer turned off.<br>2. Check connector for bent or missing pins.<br>3. Ensure that none of the keys are depressed.<br>4. Replace keyboard. |
| Parity Check 2 | Parity RAM failure. | Run Computer Setup and Diagnostic utilities. |

# Interpreting POST Diagnostic Front Panel LEDs and Audible Codes

This section covers the front panel LED codes as well as the audible codes that may occur before or during POST that do not necessarily have an error code or text message associated with them.

⚠ **WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

**NOTE:** If you see flashing LEDs on a PS/2 keyboard, look for flashing LEDs on the front panel of the computer and refer to the following table to determine the front panel LED codes.

Recommended actions in the following table are listed in the order in which they should be performed.

Not all diagnostic lights and audible codes are available on all models.

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes**

| Activity | Beeps | Possible Cause | Recommended Action |
|---|---|---|---|
| Green Power LED On. | None | Computer on. | None |
| Green Power LED flashes every two seconds. | None | Computer in Suspend to RAM mode (some models only) or normal Suspend mode. | None required. Press any key or move the mouse to wake the computer. |
| Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 2 | Processor thermal protection activated:<br><br>A fan may be blocked or not turning.<br><br>OR<br><br>The heat sink/fan assembly is not properly attached to the processor. | 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.<br><br>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.<br><br>3. If fan is plugged in, but is not spinning, then replace heat sink/fan assembly.<br><br>4. Contact an authorized reseller or service provider. |
| Red Power LED flashes three times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 3 | Processor not installed (not an indicator of bad processor). | 1. Check to see that the processor is present.<br><br>2. Reseat the processor. |

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

| Activity | Beeps | Possible Cause | Recommended Action |
|---|---|---|---|
| Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 4 | Power failure (power supply is overloaded).<br><br>OR<br><br>The incorrect external power supply adapter is being used on the USDT. | 1. Open the hood and ensure the 4 or 6-wire power supply cable is seated into the connector on the system board.<br><br>2. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly.<br><br>3. Replace the power supply.<br><br>4. Replace the system board.<br><br>OR<br><br>The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter. |
| Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 5 | Pre-video memory error. | **CAUTION:** To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.<br><br>1. Reseat DIMMs.<br><br>2. Replace DIMMs one at a time to isolate the faulty module.<br><br>3. Replace third-party memory with HP memory.<br><br>4. Replace the system board. |
| Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 6 | Pre-video graphics error. | For systems with a graphics card:<br><br>1. Reseat the graphics card.<br><br>2. Replace the graphics card.<br><br>3. Replace the system board.<br><br>For systems with integrated graphics, replace the system board. |
| Red Power LED flashes seven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 7 | System board failure (ROM detected failure prior to video). | Replace the system board. |

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

| Activity | Beeps | Possible Cause | Recommended Action |
|---|---|---|---|
| Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 8 | Invalid ROM based on bad checksum. | 1. Reflash the system ROM with the latest BIOS image. See the “Boot Block Emergency Recovery Mode” section of the *Desktop Management Guide* for more information.<br>2. Replace the system board. |
| Red Power LED flashes nine times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 9 | System powers on but is unable to boot. | 1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region.<br>2. Unplug the AC power cord from the computer, wait 30 seconds, then plug the power cord back in to the computer.<br>3. Replace the system board.<br>4. Replace the processor. |
| Red Power LED flashes ten times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 10 | Bad option card. | 1. Check each option card by removing the card (one at a time if multiple cards), then power on the system to see if fault goes away.<br>2. Once a bad card is identified, remove and replace the bad option card.<br>3. Replace the system board. |

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

| Activity | Beeps | Possible Cause | Recommended Action |
|---|---|---|---|
| Red Power LED flashes eleven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved. | 11 | The current processor does not support a feature previously enabled on this system. | 1. Install a TXT capable processor.<br>2. Disable TXT in the Computer Setup (F10) utility.<br>3. Reinstall the original processor. |
| System does not power on and LEDs are not flashing. | None | System unable to power on. | Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, the power button is working correctly. Try the following:<br>1. Check that the voltage selector (some models), located on the rear of the power supply, is set to the appropriate voltage. Proper voltage setting depends on your region.<br>2. Replace the system board.<br>OR<br>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:<br>1. Check that the unit is plugged into a working AC outlet.<br>2. Open hood and check that the power button harness is properly connected to the system board.<br>3. Check that both power supply cables are properly connected to the system board.<br>4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness. If the problem persists, replace the system board.<br>5. If the 5V_aux light on the system board is not turned on, remove the expansion cards one at a time until the 5V_aux light on the system board turns on. It the problem persists, replace the power supply. |

# D Troubleshooting Without Diagnostics

This chapter provides information on how to identify and correct minor problems, such as diskette drive, hard drive, optical drive, graphics, audio, memory, and software problems. If you encounter problems with the computer, refer to the tables in this chapter for probable causes and recommended solutions.

**NOTE:** For information on specific error messages that may appear on the screen during Power-On Self-Test (POST) at startup, refer to Appendix A, POST Error Messages on page 189.

## Safety and Comfort

**WARNING!** Misuse of the computer or failure to establish a safe and comfortable work environment may result in discomfort or serious injury. Refer to the *Safety & Comfort Guide* at http://www.hp.com/ergo for more information on choosing a workspace and creating a safe and comfortable work environment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. For more information, refer to the *Safety & Regulatory Information* guide.

## Before You Call for Technical Support

If you are having problems with the computer, try the appropriate solutions below to try to isolate the exact problem before calling for technical support.

- Run the HP diagnostic tool.
- Run the hard drive self-test in Computer Setup. Refer to the *Computer Setup (F10) Utility Guide* for more information.
- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to Appendix A, POST Error Messages on page 189 for more information.
- If the screen is blank, plug the monitor into a different video port on the computer if one is available. Or, replace the monitor with a monitor that you know is functioning properly.
- If you are working on a network, plug another computer with a different cable into the network connection. There may be a problem with the network plug or cable.
- If you recently added new hardware, remove the hardware and see if the computer functions properly.
- If you recently installed new software, uninstall the software and see if the computer functions properly.

- Boot the computer to the Safe Mode to see if it will boot without all of the drivers loaded. When booting the operating system, use “Last Known Configuration.”
- Refer to the comprehensive online technical support at http://www.hp.com/support.
- Refer to Helpful Hints on page 201 in this guide.

To assist you in resolving problems online, HP Instant Support Professional Edition provides you with self-solve diagnostics. If you need to contact HP support, use HP Instant Support Professional Edition's online chat feature. Access HP Instant Support Professional Edition at: http://www.hp.com/go/ispe.

Access the Business Support Center (BSC) at http://www.hp.com/go/bizsupport for the latest online support information, software and drivers, proactive notification, and worldwide community of peers and HP experts.

If it becomes necessary to call for technical assistance, be prepared to do the following to ensure that your service call is handled properly:

- Be in front of your computer when you call.
- Write down the computer serial number, product ID number, and monitor serial number before calling.
- Spend time troubleshooting the problem with the service technician.
- Remove any hardware that was recently added to your system.
- Remove any software that was recently installed.
- Restore the system from the Recovery Disc Set that you created or restore the system to its original factory condition in HP Backup and Recovery Manager.

△ **CAUTION:** Restoring the system will erase all data on the hard drive. Be sure to back up all data files before running the restore process.

**NOTE:** For sales information and warranty upgrades (Care Packs), call your local authorized service provider or dealer.

# Helpful Hints

If you encounter problems with the computer, monitor, or software, see the following list of general suggestions before taking further action:

- Check that the computer and monitor are plugged into a working electrical outlet.
- Check that the voltage select switch (some models) is set to the appropriate voltage for your region (115V or 230V).
- Check that the computer is turned on and the green power light is on.
- Check that the monitor is turned on and the green monitor light is on.
- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to Appendix A, POST Error Messages on page 189 for more information.
- Turn up the brightness and contrast controls of the monitor if the monitor is dim.

- Press and hold any key. If the system beeps, then the keyboard should be operating correctly.
- Check all cable connections for loose connections or incorrect connections.
- Wake the computer by pressing any key on the keyboard or pressing the power button. If the system remains in suspend mode, shut down the computer by pressing and holding the power button for at least four seconds then press the power button again to restart the computer. If the system will not shut down, unplug the power cord, wait a few seconds, then plug it in again. The computer will restart if it is set to power on automatically as soon as power is restored in Computer Setup. If it does not restart, press the power button to start the computer.
- Reconfigure the computer after installing a non-plug and play expansion board or other option. See Solving Hardware Installation Problems on page 227 for instructions.
- Be sure that all the needed device drivers have been installed. For example, if you are using a printer, you need a driver for that model printer.
- Remove all bootable media (diskette, CD, or USB device) from the system before turning it on.
- If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.
- If the system has multiple video sources (embedded, PCI, or PCI-Express adapters) installed (embedded video on some models only) and a single monitor, the monitor must be plugged into the monitor connector on the source selected as the primary VGA adapter. During boot, the other monitor connectors are disabled and if the monitor is connected into these ports, the monitor will not function. You can select which source will be the default VGA source in Computer Setup.

△ **CAUTION:** When the computer is plugged into an AC power source, there is always voltage applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

# Solving General Problems

You may be able to easily resolve the general problems described in this section. If a problem persists and you are unable to resolve it yourself or if you feel uncomfortable about performing the operation, contact an authorized dealer or reseller.

⚠ **WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

**Table D-1 Solving General Problems**

**Computer appears locked up and will not turn off when the power button is pressed.**

| Cause | Solution |
|---|---|
| Software control of the power switch is not functional. | 1. Press and hold the power button for at least four seconds until the computer turns off.<br>2. Disconnect the power cord from the electrical outlet. |

**Computer will not respond to USB keyboard or mouse.**

| Cause | Solution |
|---|---|
| Computer is in **standby** mode. | To resume from **standby** mode, press the power button or press any key.<br>**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data. |
| System has locked up. | Restart computer. |

**Computer date and time display is incorrect.**

| Cause | Solution |
|---|---|
| RTC (real-time clock) battery may need to be replaced.<br>**NOTE:** Connecting the computer to a live AC outlet prolongs the life of the RTC battery. | First, reset the date and time under **Control Panel** (Computer Setup can also be used to update the RTC date and time). If the problem persists, replace the RTC battery. See the *Hardware Reference Guide* for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement. |

**Cursor will not move using the arrow keys on the keypad.**

| Cause | Solution |
|---|---|
| The Num Lock key may be on. | Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled (or enabled) in Computer Setup. |

**Table D-1 Solving General Problems (continued)**

**There is no sound or sound volume is too low.**

| Cause | Solution |
|---|---|
| System volume may be set low or muted. | 1. Check the F10 BIOS settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers).<br>2. Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly.<br>3. Use the system volume control available in the operating system to make sure the speakers are not muted or to increase the volume. |

**Cannot remove computer cover or access panel.**

| Cause | Solution |
|---|---|
| Smart Cover Lock, featured on some computers, is locked. | Unlock the Smart Cover Lock using Computer Setup.<br>The Smart Cover FailSafe Key, a device for manually disabling the Smart Cover Lock, is available from HP. You will need the FailSafe Key in case of forgotten password, power loss, or computer malfunction. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key. |

**Poor performance is experienced.**

| Cause | Solution |
|---|---|
| Processor is hot. | 1. Make sure airflow to the computer is not blocked. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.<br>2. Make sure fans are connected and working properly (some fans only operate when needed).<br>3. Make sure the processor heat sink is installed properly. |
| Hard drive is full. | Transfer data from the hard drive to create more space on the hard drive. |
| Low on memory. | Add more memory. |
| Hard drive fragmented. | Defragment hard drive. |
| Program previously accessed did not release reserved memory back to the system. | Restart the computer. |
| Virus resident on the hard drive. | Run virus protection program. |

**Table D-1 Solving General Problems (continued)**

**Poor performance is experienced.**

| Cause | Solution |
|---|---|
| Too many applications running. | 1. Close unnecessary applications to free up memory.<br>2. Add more memory. Some applications run in the background and can be closed by right-clicking on their corresponding icons in the task tray. To prevent these applications from launching at startup, go to **Start** > **Run** (Windows XP) or **Start** > **Accessories** > **Run** (Windows Vista) and type `msconfig`. On the **Startup** tab of the System Configuration Utility, clear applications that you do not want to launch automatically. |
| Some software applications, especially games, are stressful on the graphics subsystem | 1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application.<br>2. Add more memory.<br>3. Upgrade the graphics solution. |
| Cause unknown. | Restart the computer. |

**Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing).**

| Cause | Solution |
|---|---|
| Processor thermal protection activated:<br>A fan may be blocked or not turning.<br>OR<br>The heat sink is not properly attached to the processor. | 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.<br>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.<br>3. If fan is plugged in, but is not spinning, then replace the heat sink/fan assembly.<br>4. Contact an authorized reseller or service provider. |

**Table D-1 Solving General Problems (continued)**

**System does not power on and the LEDs on the front of the computer are not flashing.**

| Cause | Solution |
|---|---|
| System unable to power on. | Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then:<br>1. Check that the voltage selector, located on the rear of the power supply on some models, is set to the appropriate voltage. Proper voltage setting depends on your region.<br>2. Remove the expansion cards one at a time until the 5V_aux light on the system board turns on.<br>3. Replace the system board.<br>OR<br>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:<br>1. Check that the unit is plugged into a working AC outlet.<br>2. Open hood and check that the power button harness is properly connected to the system board.<br>3. Check that both power supply cables are properly connected to the system board.<br>4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness.<br>5. If the 5V_aux light on the system board is off, then replace the power supply.<br>6. Replace the system board. |

# Solving Power Problems

Common causes and solutions for power problems are listed in the following table.

**Table D-2 Solving Power Problems**

**Power supply shuts down intermittently.**

| Cause | Solution |
|---|---|
| Voltage selector switch on rear of computer chassis (some models) not switched to correct line voltage (115V or 230V). | Select the proper AC voltage using the selector switch. |
| Power supply will not turn on because of internal power supply fault. | Contact an authorized service provider to replace the power supply. |

**Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Processor thermal protection activated:<br><br>A fan may be blocked or not turning.<br><br>OR<br><br>The heat sink is not properly attached to the processor. | 1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.<br><br>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.<br><br>3. If fan is plugged in, but is not spinning, then replace the heat sink/fan assembly.<br><br>4. Contact an authorized reseller or service provider. |

**Table D-2 Solving Power Problems (continued)**

**Power LED flashes Red four times, once every second, followed by a two second pause, and the computer beeps four times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Power failure (power supply is overloaded). | 1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region.<br>2. Open the hood and ensure the 4- or 6-wire power supply cable is seated into the connector on the system board.<br>3. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly.<br>4. Replace the power supply.<br>5. Replace the system board. |
| The incorrect external power supply adapter is being used on the USDT. | The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter. |

# Solving Diskette Problems

Common causes and solutions for diskette problems are listed in the following table.

**NOTE:** The computer does not support internal diskette drives. Only USB diskette drives are supported.

**NOTE:** You may need to reconfigure the computer when you add or remove hardware, such as an additional diskette drive. See Solving Hardware Installation Problems on page 227 for instructions.

**Table D-3 Solving Diskette Problems**

**Diskette drive light stays on.**

| Cause | Solution |
|---|---|
| Diskette is damaged. | In Microsoft Windows XP, right-click **Start**, click **Explore**, and select a drive. Select **File** > **Properties** > **Tools**. Under **Error-checking** click **Check Now**.<br><br>In Microsoft Windows Vista, right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**. |
| Diskette is incorrectly inserted. | Remove diskette and reinsert. |
| Drive cable is not properly connected. | Reconnect drive cable. Ensure that all four pins on the diskette power cable are connected to the drive. |

**Drive not found.**

| Cause | Solution |
|---|---|
| Cable is loose. | Reseat diskette drive data and power cable. |
| Removable drive is not seated properly. | Reseat the drive. |

**Diskette drive cannot write to a diskette.**

| Cause | Solution |
|---|---|
| Diskette is not formatted. | Format the diskette.<br><br>1. From Windows Explorer select the disk **(A)** drive.<br><br>2. Right-click the drive letter and select **Format**.<br><br>3. Select the desired options, and click **Start** to begin formatting the diskette. |
| Diskette is write-protected. | Use another diskette or remove the write protection. |
| Writing to the wrong drive. | Check the drive letter in the path statement. |
| Not enough space is left on the diskette. | 1. Use another diskette.<br><br>2. Delete unneeded files from diskette. |
| Diskette is damaged. | Replace the damaged disk. |

**Table D-3 Solving Diskette Problems (continued)**

**Cannot format diskette.**

| Cause | Solution |
|---|---|
| Invalid media reported. | When formatting a disk in MS-DOS, you may need to specify diskette capacity. For example, to format a 1.44-MB diskette, type the following command at the MS-DOS prompt:<br><br>`FORMAT A: /F:1440` |
| Disk may be write-protected. | Open the locking device on the diskette. |
| Legacy diskette writes are disabled in Computer Setup. | Enter Computer Setup and enable **Legacy Diskette Write** in **Storage** > **Storage Options**. |

**A problem has occurred with a disk transaction.**

| Cause | Solution |
|---|---|
| The directory structure is bad, or there is a problem with a file. | In Microsoft Windows XP, right-click **Start**, click **Explore**, and select a drive. Select **File** > **Properties** > **Tools**. Under **Error-checking**, click **Check Now**.<br><br>In Microsoft Windows Vista, right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**. |

**Diskette drive cannot read a diskette.**

| Cause | Solution |
|---|---|
| You are using the wrong diskette type for the drive type. | Check the type of drive that you are using and use the correct diskette type. |
| You are reading the wrong drive. | Check the drive letter in the path statement. |
| Diskette is damaged. | Replace the diskette with a new one. |

**“Invalid system disk” message is displayed.**

| Cause | Solution |
|---|---|
| A diskette that does not contain the system files needed to start the computer has been inserted in the drive. | When drive activity stops, remove the diskette and press the Spacebar. The computer should start up. |
| Diskette error has occurred. | Restart the computer by pressing the power button. |

**Cannot Boot to Diskette.**

| Cause | Solution |
|---|---|
| Diskette is not bootable. | Replace with a bootable diskette. |

**Table D-3 Solving Diskette Problems (continued)**

**Cannot Boot to Diskette.**

| Cause | Solution |
|---|---|
| Diskette boot has been disabled in Computer Setup. | 1. Run Computer Setup and enable diskette boot in **Storage** > **Boot Order**.<br>2. Run Computer Setup and enable diskette boot in **Storage** > **Storage Options** > **Removable Media Boot**.<br>**NOTE:** Both steps should be used as the **Removable Media Boot** function in Computer Setup overrides the **Boot Order** enable command. |
| Network server mode is enabled in Computer Setup. | Run Computer Setup and disable **Network Server Mode** in **Security** > **Password Options**. |

# Solving Hard Drive Problems

**Table D-4 Solving Hard Drive Problems**

**Hard drive error occurs.**

| Cause | Solution |
|---|---|
| Hard disk has bad sectors or has failed. | 1. In Microsoft Windows XP, right-click **Start**, click **Explore**, and select a drive. Select **File** > **Properties** > **Tools**. Under **Error-checking**, click **Check Now**.<br><br>In Microsoft Windows Vista, right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**.<br><br>2. Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk. |

**Disk transaction problem.**

| Cause | Solution |
|---|---|
| Either the directory structure is bad or there is a problem with a file. | In Microsoft Windows XP, right-click **Start**, click **Explore**, and select a drive. Select **File** > **Properties** > **Tools**. Under **Error-checking**, click **Check Now**.<br><br>In Microsoft Windows Vista, right-click **Start**, click **Explore**, and right-click on a drive. Select **Properties** then select the **Tools** tab. Under **Error-checking** click **Check Now**. |

**Drive not found (identified).**

| Cause | Solution |
|---|---|
| Cable could be loose. | Check cable connections. |
| The system may not have automatically recognized a newly installed device. | See reconfiguration directions in the Solving Hardware Installation Problems on page 227 section. If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem.<br><br>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under **Advanced** > **Power-On**. |
| The device is attached to a SATA port that has been hidden in Computer Setup. | Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Security** > **Device Security**. |
| Drive responds slowly immediately after power-up. | Run Computer Setup and increase the POST Delay in **Advanced** > **Power-On Options**. |

**Table D-4 Solving Hard Drive Problems (continued)**

**Nonsystem disk/NTLDR missing message.**

| Cause | Solution |
|---|---|
| The system is trying to start from a diskette that is not bootable. | Remove the diskette from the diskette drive. |
| The system is trying to start from the hard drive but the hard drive may have been damaged. | 1. Insert a bootable diskette into the diskette drive and restart the computer.<br>2. Check the hard drive format using fdisk: If NTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed. |
| System files missing or not properly installed. | 1. Insert a bootable diskette into the diskette drive and restart the computer.<br>2. Check the hard drive format using Fdisk: If NFTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed.<br>3. Install system files for the appropriate operating system. |
| Hard drive boot has been disabled in Computer Setup. | Run the Computer Setup utility and enable the hard drive entry in the **Storage** > **Boot Order** list. |
| Bootable hard drive is not attached as first in a multi-hard drive configuration. | If attempting to boot from a hard drive, ensure it is attached to the system board connector labeled P60 SATA 0. |
| Bootable hard drive's controller is not listed first in the Boot Order. | Run the Computer Setup utility and select **Storage** > **Boot Order** and ensure the bootable hard drive's controller is listed immediately under the **Hard Drive** entry. |

**Computer will not boot from hard drive.**

| Cause | Solution |
|---|---|
| The device is attached to a SATA port that has been hidden in Computer Setup. | Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Security** > **Device Security**. |
| Boot order is not correct. | Run the Computer Setup utility and change boot sequence in **Storage** > **Boot Order**. |
| Hard Drive's “Emulation Type” is set to “None.” | Run the Computer Setup utility and change the “Emulation Type” to “Hard Disk” in the device's details under **Storage** > **Device Configuration**. |
| Hard drive is damaged. | Observe if the front panel Power LED is blinking RED and if any beeps are heard. See Appendix A, POST Error Messages on page 189 to determine possible causes for the blinking red and beep codes.<br>See the Worldwide Limited Warranty for terms and conditions. |

**Table D-4 Solving Hard Drive Problems (continued)**

**Computer seems to be locked up.**

| Cause | Solution |
|---|---|
| Program in use has stopped responding to commands. | Attempt the normal Windows “Shut Down” procedure. If this fails, press the power button for four or more seconds to turn off the power. To restart the computer, press the power button again. |

**The removable hard drive has no power to the hard drive enclosure.**

| Cause | Solution |
|---|---|
| The lock on the enclosure is not turned to the “ON” position. | Insert the key and turn the lock clockwise 90 degrees. The green LED on the front of the enclosure should be on. |
| Power cable from the computer power supply to the enclosure frame is not properly connected. | Check the power supply to make sure it is properly connected to the rear of the enclosure frame. |

**The removable hard drive is not recognized by the computer.**

| Cause | Solution |
|---|---|
| The removable hard drive carrier is not fully seated in the enclosure frame or the hard drive is not fully seated in the carrier. | Push the carrier into the enclosure frame so that the connector on the rear of the frame is properly seated. If this does not solve the problem, turn off the computer, remove the carrier, and check to see if the connector on the hard drive is properly seated in the carrier. |

**The removable hard drive enclosure is beeping and the green LED is flashing.**

| Cause | Solution |
|---|---|
| Fan failure alarm on the removable hard drive enclosure has been activated. | Shut down the computer and contact HP for a replacement enclosure. |

# Solving Media Card Reader Problems

**Table D-5 Solving Media Card Reader Problems**

**Media card will not work in a digital camera after formatting it in Microsoft Windows XP or Microsoft Windows Vista.**

| Cause | Solution |
|---|---|
| By default, Windows XP and Windows Vista will format any media card with a capacity greater than 32MB with the FAT32 format. Most digital cameras use the FAT (FAT16 & FAT12) format and can not operate with a FAT32 formatted card. | Either format the media card in the digital camera or select FAT file system to format the media card in a computer with Windows XP or Windows Vista. |

**A write-protected or locked error occurs when attempting to write to the media card.**

| Cause | Solution |
|---|---|
| Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/ Memory Stick/PRO card. | If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position. |

**Can not write to the media card.**

| Cause | Solution |
|---|---|
| The media card is a read-only memory (ROM) card. | Check the manufacturer's documentation included with your card to see if it writable. Refer to the previous section for a list of compatible cards. |
| Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/ Memory Stick/PRO card. | If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position. |

**Unable to access data on the media card after inserting it into a slot.**

| Cause | Solution |
|---|---|
| The media card is not inserted properly, is inserted in the wrong slot, or is not supported. | Ensure that the card is inserted properly with the gold contact on the correct side. The green LED will light if inserted properly. |

**Table D-5 Solving Media Card Reader Problems (continued)**

**Do not know how to remove a media card correctly.**

| Cause | Solution |
|---|---|
| The computer's software is used to safely eject the card. | Open **My Computer** (Windows XP) or **Computer** (Windows Vista), right-click on the corresponding drive icon, and select **Eject**. Then pull the card out of the slot.<br><br>**NOTE:** Never remove the card when the green LED is flashing |

**After installing the media card reader and booting to Windows, the reader and the inserted cards are not recognized by the computer.**

| Cause | Solution |
|---|---|
| The operating system needs time to recognize the device if the reader was just installed into the computer and you are turning the PC on for the first time. | Wait a few seconds so that the operating system can recognize the reader and the available ports, and then recognize whatever media is inserted in the reader. |

**After inserting a media card in the reader, the computer attempts to boot from the media card.**

| Cause | Solution |
|---|---|
| The inserted media card has boot capability. | If you do not want to boot from the media card, remove it during boot or do not select the option to boot from the inserted media card during the boot process. |

# Solving Display Problems

If you encounter display problems, see the documentation that came with the monitor and to the common causes and solutions listed in the following table.

**Table D-6 Solving Display Problems**

**Blank screen (no video).**

| Cause | Solution |
|---|---|
| Monitor is not turned on and the monitor light is not on. | Turn on the monitor and check that the monitor light is on. |
| Bad monitor. | Try a different monitor. |
| The cable connections are not correct. | Check the cable connection from the monitor to the computer and to the electrical outlet. |
| You may have a screen blanking utility installed or energy saver features are enabled. | Press any key or click the mouse button and, if set, type your password. |
| System ROM is corrupted; system is running in Boot Block Emergency Recovery Mode (indicated by eight beeps). | Reflash the system ROM with the latest BIOS image. See the “Boot Block Emergency Recovery Mode” section of the *Desktop Management Guide* for more information |
| You are using a fixed-sync monitor and it will not sync at the resolution chosen. | Be sure that the monitor can accept the same horizontal scan rate as the resolution chosen. |
| Computer is in **standby** mode. | Press the power button to resume from **standby** mode.<br><br>**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data. |
| Monitor cable is plugged into the wrong connector. | If the computer system has both an integrated graphics connector and an add-in graphics card connector, plug the monitor cable into the graphics card connector on the back of the computer. |
| Monitor settings in the computer are not compatible with the monitor. | 1. In Windows XP Control Panel, double-click the **Display** icon and select the **Settings** tab.<br><br>In Windows Vista Control Panel, under **Appearance and Personalization**, select **Adjust screen resolution**.<br><br>2. Use the sliding control to reset the resolution. |
| Monitor is configured to use an input that is not active. | Use the monitor's on-screen menu controls to select the input that is being driven by the system. Refer to the monitor's user documentation for more information on the on-screen controls and settings. |

**Cannot enable integrated graphics after installing a PCI Express graphics card.**

| Cause | Solution |
|---|---|
| On systems with Intel integrated graphics, the integrated graphics cannot be enabled after installing a PCI Express x16. | The integrated graphics can be enabled in Computer Setup if a PCI or PCI Express x1 graphics card is installed, but it cannot be enabled if there is a graphics card in the PCI Express x16 slot. |

**Table D-6 Solving Display Problems (continued)**

**Blank screen and the power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Pre-video memory error. | 1. Reseat DIMMs. Power on the system.<br>2. Replace DIMMs one at a time to isolate the faulty module.<br>3. Replace third-party memory with HP memory.<br>4. Replace the system board. |

**Blank screen and the power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Pre-video graphics error. | For systems with a graphics card:<br>1. Reseat the graphics card. Power on the system.<br>2. Replace the graphics card.<br>3. Replace the system board.<br>For systems with integrated graphics, replace the system board. |

**Blank screen and the power LED flashes Red seven times, once every second, followed by a two second pause, and the computer beeps seven times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| System board failure (ROM detected failure prior to video). | Replace the system board. |

**Monitor does not function properly when used with energy saver features.**

| Cause | Solution |
|---|---|
| Monitor without energy saver capabilities is being used with energy saver features enabled. | Disable monitor energy saver feature. |

**Dim characters.**

| Cause | Solution |
|---|---|
| The brightness and contrast controls are not set properly. | Adjust the monitor brightness and contrast controls. |
| Cables are not properly connected. | Check that the graphics cable is securely connected to the graphics card and the monitor. |

**Table D-6 Solving Display Problems (continued)**

**Blurry video or requested resolution cannot be set.**

| Cause | Solution |
|---|---|
| If the graphics controller was upgraded, the correct graphics drivers may not be loaded. | Install the video drivers included in the upgrade kit. |
| Monitor is not capable of displaying requested resolution. | Change requested resolution. |
| Graphics card is bad. | Replace the graphics card. |

**The picture is broken up, rolls, jitters, or flashes.**

| Cause | Solution |
|---|---|
| The monitor connections may be incomplete or the monitor may be incorrectly adjusted. | 1. Be sure the monitor cable is securely connected to the computer.<br>2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart.<br>3. Fluorescent lights or fans may be too close to the monitor. |
| Monitor needs to be degaussed. | Degauss the monitor. Refer to the documentation that came with the monitor for instructions. |

**Image is not centered.**

| Cause | Solution |
|---|---|
| Position may need adjustment. | Press the monitor's Menu button to access the OSD menu. Select **ImageControl/ Horizontal Position** or **Vertical Position** to adjust the horizontal or vertical position of the image. |

**"No Connection, Check Signal Cable" displays on screen.**

| Cause | Solution |
|---|---|
| Monitor video cable is disconnected. | Connect the video cable between the monitor and computer.<br>**CAUTION:** Ensure that the computer power is off while connecting the video cable. |

**"Out of Range" displays on screen.**

| Cause | Solution |
|---|---|
| Video resolution and refresh rate are set higher than what the monitor supports. | Restart the computer and enter Safe Mode. Change the settings to a supported setting then restart the computer so that the new settings take effect. |

**Table D-6 Solving Display Problems (continued)**

**Vibrating or rattling noise coming from inside a CRT monitor when powered on.**

| Cause | Solution |
|---|---|
| Monitor degaussing coil has been activated. | None. It is normal for the degaussing coil to be activated when the monitor is powered on. |

**Clicking noise coming from inside a CRT monitor.**

| Cause | Solution |
|---|---|
| Electronic relays have been activated inside the monitor. | None. It is normal for some monitors to make a clicking noise when turned on and off, when going in and out of standby mode, and when changing resolutions. |

**High pitched noise coming from inside a flat panel monitor.**

| Cause | Solution |
|---|---|
| Brightness and/or contrast settings are too high. | Lower brightness and/or contrast settings. |

**Fuzzy focus; streaking, ghosting, or shadowing effects; horizontal scrolling lines; faint vertical bars; or unable to center the picture on the screen (flat panel monitors using an analog VGA input connection only).**

| Cause | Solution |
|---|---|
| Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card. | 1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu.<br>2. Manually synchronize the Clock and Clock Phase on-screen display functions. To download a SoftPaq that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: http://www.hp.com/support |
| Graphics card is not seated properly or is bad. | 1. Reseat the graphics card.<br>2. Replace the graphics card. |

**Certain typed symbols do not appear correct.**

| Cause | Solution |
|---|---|
| The font you are using does not support that particular symbol. | Use the Character Map to locate and select the appropriate symbol. Click **Start** > **All Programs** > **Accessories** > **System Tools** > **Character Map**. You can copy the symbol from the Character Map into a document. |

# Solving Audio Problems

If the computer has audio features and you encounter audio problems, see the common causes and solutions listed in the following table.

**Table D-7 Solving Audio Problems**

**Sound cuts in and out.**

| Cause | Solution |
|---|---|
| Processor resources are being used by other open applications. | Shut down all open processor-intensive applications. |
| Direct sound latency, common in many media player applications. | In Windows XP only:<br>1. From the **Control Panel**, select **Sounds and Audio Devices**.<br>2. On the **Audio** tab, select a device from the **Sound Playback** list.<br>3. Click the **Advanced** button and select the **Performance** tab.<br>4. Set the **Hardware acceleration** slider to **None** and the **Sample rate conversion quality** slider to **Good** and retest the audio.<br>5. Set the **Hardware acceleration** slider to **Full** and the **Sample rate conversion quality** slider to **Best** and retest the audio. |

**Sound does not come out of the speaker or headphones.**

| Cause | Solution |
|---|---|
| Software volume control is turned down or muted. | Double-click the **Speaker** icon on the taskbar, then make sure that **Mute** is not selected and use the volume slider to adjust the volume. |
| Audio is hidden in Computer Setup. | Enable the audio in Computer Setup: **Security** > **Device Security** > **System Audio**. |
| The external speakers are not turned on. | Turn on the external speakers. |
| The audio device may be connected to the wrong jack. | Ensure that the device is connected to the correct jack on the computer. The speakers should be plugged into the rear line-out jack and the headphones should be plugged into the front headphone jack. |
| External speakers plugged into the wrong audio jack on a recently installed sound card. | See the sound card documentation for proper speaker connection. |
| Digital CD audio is not enabled. | Enable digital CD audio. In the Device Manager, right-click on the CD/DVD device and select **Properties**. Make sure **Enable digital CD audio for this CD-ROM device** is checked. |
| Headphones or devices connected to the line-out connector mute the internal speaker. | Turn on and use headphones or external speakers, if connected, or disconnect headphones or external speakers. |

**Table D-7 Solving Audio Problems (continued)**

**Sound does not come out of the speaker or headphones.**

| Cause | Solution |
|---|---|
| Computer is in **standby** mode. | Press the power button to resume from **standby** mode.<br><br>**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data. |
| Internal speaker is disabled in Computer Setup. | Enable the internal speaker in Computer Setup. Select **Advanced** > **Device Options** > **Internal Speaker**. |
| The application is set to use a different audio device than speakers. | Some graphics cards support audio over the DisplayPort connection, so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used. |
| Some applications can select which audio output device is used. | Make sure the application has selected the correct audio device. |
| The operating system controls may be set to use a different audio device as the default output device than what is expected. | Set the operating system to use the correct audio device. |

**Sound from headphones is not clear or muffled.**

| Cause | Solution |
|---|---|
| Headphones are plugged into the rear audio output connector. The rear audio output connector is for powered audio devices and is not designed for headphone use. | Plug the headphones into the headphone connector on the front of the computer. |

**Computer appears to be locked up while recording audio.**

| Cause | Solution |
|---|---|
| The hard disk may be full. | Before recording, make sure there is enough free space on the hard disk. You can also try recording the audio file in a compressed format. |

**Line-in jack is not functioning properly.**

| Cause | Solution |
|---|---|
| Jack has been reconfigured in the audio driver or application software. | In the audio driver or application software, reconfigure the jack or set the jack to its default value. |

**Table D-7 Solving Audio Problems (continued)**

**There is no sound or sound volume is too low.**

| Cause | Solution |
|---|---|
| The application is set to use a different audio device than speakers. | Some graphics cards support audio over the DisplayPort connection, so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used. |
| Some applications can select which audio output device is used. | Make sure the application has selected the correct audio device. |
| The operating system controls may be set to use a different audio device as the default output device than what is expected. | Set the operating system to use the correct audio device. |

# Solving Printer Problems

If you encounter printer problems, see the documentation that came with the printer and to the common causes and solutions listed in the following table.

**Table D-8 Solving Printer Problems**

**Printer will not print.**

| Cause | Solution |
|---|---|
| Printer is not turned on and online. | Turn the printer on and make sure it is online. |
| The correct printer drivers for the application are not installed. | 1. Install the correct printer driver for the application.<br>2. Try printing using the MS-DOS command:<br>`DIR C:\ > [printer port]`<br>where `[printer port]` is the address of the printer being used. If the printer works, reload the printer driver. |
| If you are on a network, you may not have made the connection to the printer. | Make the proper network connections to the printer. |
| Printer may have failed. | Run printer self-test. |

**Printer will not turn on.**

| Cause | Solution |
|---|---|
| The cables may not be connected properly. | Reconnect all cables and check the power cord and electrical outlet. |

**Printer prints garbled information.**

| Cause | Solution |
|---|---|
| The correct printer driver for the application is not installed. | Install the correct printer driver for the application. |
| The cables may not be connected properly. | Reconnect all cables. |
| Printer memory may be overloaded. | Reset the printer by turning it off for one minute, then turn it back on. |

**Printer is offline.**

| Cause | Solution |
|---|---|
| The printer may be out of paper. | Check the paper tray and refill it if it is empty. Select online. |

# Solving Keyboard and Mouse Problems

If you encounter keyboard or mouse problems, see the documentation that came with the equipment and to the common causes and solutions listed in the following table.

**Table D-9 Solving Keyboard Problems**

**Keyboard commands and typing are not recognized by the computer.**

| Cause | Solution |
|---|---|
| Keyboard connector is not properly connected. | 1. On the Windows XP Desktop, click **Start** > **Shut Down**.<br>On the Windows Vista Desktop, click **Start**, click the arrow on the lower right corner of the Start menu, then select **Shut Down**.<br>2. After the shutdown is complete, reconnect the keyboard to the back of the computer and restart the computer. |
| Program in use has stopped responding to commands. | Shut down your computer using the mouse and then restart the computer. |
| Keyboard needs repairs. | See the Worldwide Limited Warranty for terms and conditions. |
| Computer is in **standby** mode. | Press the power button to resume from **standby** mode.<br>**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data. |

**Cursor will not move using the arrow keys on the keypad.**

| Cause | Solution |
|---|---|
| The Num Lock key may be on. | Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled (or enabled) in Computer Setup. |

**Table D-10 Solving Mouse Problems**

**Mouse does not respond to movement or is too slow.**

| Cause | Solution |
|---|---|
| Mouse connector is not properly plugged into the back of the computer. | Shut down the computer using the keyboard.<br>1. Press the Ctrl and Esc keys at the same time (or press the Windows logo key) to display the **Start** menu.<br>2. Use the arrow keys to select **Shut Down** and then press the Enter key.<br>3. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart. |
| Program in use has stopped responding to commands. | Shut down the computer using the keyboard then restart the computer. |

**Table D-10 Solving Mouse Problems (continued)**

**Mouse does not respond to movement or is too slow.**

| Cause | Solution |
|---|---|
| Mouse may need cleaning. | Remove the roller ball cover on the mouse and clean the internal components. |
| Mouse may need repair. | See the Worldwide Limited Warranty for terms and conditions. |
| Computer is in **standby** mode. | Press the power button to resume from **standby** mode.<br><br>**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data. |

**Mouse will only move vertically, horizontally, or movement is jerky.**

| Cause | Solution |
|---|---|
| Mouse roller ball or the rotating encoder shafts that make contact with the ball are dirty. | Remove roller ball cover from the bottom of the mouse and clean the internal components with a mouse cleaning kit available from most computer stores. |

# Solving Hardware Installation Problems

You may need to reconfigure the computer when you add or remove hardware, such as an additional drive or expansion card. If you install a plug and play device, Windows automatically recognizes the device and configures the computer. If you install a non–plug and play device, you must reconfigure the computer after completing installation of the new hardware. In Windows, use the **Add Hardware Wizard** and follow the instructions that appear on the screen.

⚠ **WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

**Table D-11 Solving Hardware Installation Problems**

**A new device is not recognized as part of the system.**

| Cause | Solution |
|---|---|
| Device is not seated or connected properly. | Ensure that the device is properly and securely connected and that pins in the connector are not bent down. |
| Cable(s) of new external device are loose or power cables are unplugged. | Ensure that all cables are properly and securely connected and that pins in the cable or connector are not bent down. |
| Power switch of new external device is not turned on. | Turn off the computer, turn on the external device, then turn on the computer to integrate the device with the computer system. |
| When the system advised you of changes to the configuration, you did not accept them. | Reboot the computer and follow the instructions for accepting the changes. |
| A plug and play board may not automatically configure when added if the default configuration conflicts with other devices. | Use Windows Device Manager to deselect the automatic settings for the board and choose a basic configuration that does not cause a resource conflict. You can also use Computer Setup to reconfigure or disable devices to resolve the resource conflict. |
| USB ports on the computer are disabled in Computer Setup. | Run the Computer Setup utility and ensure that **Device available** is selected for appropriate USB ports under **Security > Device Security**. |

**Computer will not start.**

| Cause | Solution |
|---|---|
| Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location. | 1. Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation.<br><br>**NOTE:** DIMM 1 must always be installed.<br><br>2. Observe the beeps and LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems.<br><br>3. If you still cannot resolve the issue, contact Customer Support. |

**Table D-11 Solving Hardware Installation Problems (continued)**

**Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Memory is installed incorrectly or is bad. | **CAUTION:** To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.<br>1. Reseat DIMMs. Power on the system.<br>2. Replace DIMMs one at a time to isolate the faulty module.<br>**NOTE:** DIMM 1 must always be installed.<br>3. Replace third-party memory with HP memory.<br>4. Replace the system board. |

**Power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Graphics card is not seated properly or is bad, or system board is bad. | For systems with a graphics card:<br>1. Reseat the graphics card. Power on the system.<br>2. Replace the graphics card.<br>3. Replace the system board.<br>For systems with integrated graphics, replace the system board. |

**Power LED flashes Red ten times, once every second, followed by a two second pause, and the computer beeps ten times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Bad option card. | 1. Check each option card by removing the cards one at time (if multiple cards), then power on the system to see if fault goes away.<br>2. Once bad card is identified, remove and replace bad option card.<br>3. Replace the system board. |

# Solving Network Problems

Some common causes and solutions for network problems are listed in the following table. These guidelines do not discuss the process of debugging the network cabling.

**Table D-12 Solving Network Problems**

**Wake-on-LAN feature is not functioning.**

| Cause | Solution |
|---|---|
| S5 Maximum Power Saving feature is enabled. | Disable the S5 Maximum Power Saving option in Computer Setup. Select **Power > Hardware Power Management > S5 Maximum Power Saving**. |
| Wake-on-LAN is not enabled. | To enable Wake-on-LAN in Windows XP:<br>1. Select **Start** > **Control Panel**.<br>2. Double-click **Network Connections**.<br>3. Double-click **Local Area Connection**.<br>4. Click **Properties**.<br>5. Click **Configure**.<br>6. Click the **Power Management** tab, then select the check box to **Allow this device to bring the computer out of standby**.<br>To enable Wake-on-LAN in Windows Vista:<br>1. Select **Start** > **Control Panel**.<br>2. Under **Network and Internet**, select **View network status and tasks**.<br>3. In the **Tasks** list, select **Manage network connections**.<br>4. Double-click **Local Area Connection**.<br>5. Click the **Properties** button.<br>6. Click the **Configure** button.<br>7. Click the **Power Management** tab, then select the check box to **Allow this device to wake the computer**. |

**Network driver does not detect network controller.**

| Cause | Solution |
|---|---|
| Network controller is disabled. | 1. Run Computer Setup and enable network controller.<br>2. Enable the network controller in the operating system via Device Manager. |
| Incorrect network driver. | Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's Web site. |

**Table D-12 Solving Network Problems (continued)**

**Network status link light never flashes.**

**NOTE: The network status light is supposed to flash when there is network activity.**

| Cause | Solution |
|---|---|
| No active network is detected. | Check cabling and network equipment for proper connection. |
| Network controller is not set up properly. | Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status. |
| Network controller is disabled. | 1. Run Computer Setup and enable network controller.<br>2. Enable the network controller in the operating system via Device Manager. |
| Network driver is not properly loaded. | Reinstall network drivers. |
| System cannot autosense the network. | Disable auto-sensing capabilities and force the system into the correct operating mode. |

**Diagnostics reports a failure.**

| Cause | Solution |
|---|---|
| The cable is not securely connected. | Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device. |
| The cable is attached to the incorrect connector. | Ensure that the cable is attached to the correct connector. |
| There is a problem with the cable or a device at the other end of the cable. | Ensure that the cable and device at the other end are operating correctly. |
| Network controller interrupt is shared with an expansion board. | Under the Computer Setup **Advanced** menu, change the resource settings for the board. |
| The network controller is defective. | Contact an authorized service provider. |

**Diagnostics passes, but the computer does not communicate with the network.**

| Cause | Solution |
|---|---|
| Network drivers are not loaded, or driver parameters do not match current configuration. | Make sure the network drivers are loaded and that the driver parameters match the configuration of the network controller.<br>Make sure the correct network client and protocol is installed. |
| The network controller is not configured for this computer. | Select the **Network** icon in the **Control Panel** and configure the network controller. |

**Network controller stopped working when an expansion board was added to the computer.**

| Cause | Solution |
|---|---|
| Network controller interrupt is shared with an expansion board. | Under the Computer Setup **Advanced** menu, change the resource settings for the board. |

**Table D-12 Solving Network Problems (continued)**

**Network controller stopped working when an expansion board was added to the computer.**

| Cause | Solution |
|---|---|
| The network controller requires drivers. | Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed. |
| The expansion board installed is a network card (NIC) and conflicts with the embedded NIC. | Under the Computer Setup **Advanced** menu, change the resource settings for the board. |

**Network controller stops working without apparent cause.**

| Cause | Solution |
|---|---|
| The files containing the network drivers are corrupted. | Reinstall the network drivers, using the Recovery Disc Set created from the hard drive's Recovery Partition. |
| The cable is not securely connected. | Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device. |
| The network controller is defective. | Contact an authorized service provider. |

**New network card will not boot.**

| Cause | Solution |
|---|---|
| New network card may be defective or may not meet industry-standard specifications. | Install a working, industry-standard NIC, or change the boot sequence to boot from another source. |

**Cannot connect to network server when attempting Remote System Installation.**

| Cause | Solution |
|---|---|
| The network controller is not configured properly. | Verify Network Connectivity, that a DHCP Server is present, and that the Remote System Installation Server contains the NIC drivers for your NIC. |

**System setup utility reports unprogrammed EEPROM.**

| Cause | Solution |
|---|---|
| Unprogrammed EEPROM. | Contact an authorized service provider. |

# Solving Memory Problems

If you encounter memory problems, some common causes and solutions are listed in the following table.

△ **CAUTION:** Power may still be supplied to the DIMMs when the computer is turned off (depending on the Management Engine (ME) settings). To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.

For those systems that support ECC memory, HP does not support mixing ECC and non-ECC memory. Otherwise, the computer will not boot the operating system.

**NOTE:** The memory count will be affected by configurations with the Management Engine (ME) enabled. The ME uses 8MB of system memory in single channel mode or 16MB of memory in dual-channel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), third-party data storage, and other management functions.

**Table D-13 Solving Memory Problems**

**System will not boot or does not function properly after installing additional memory modules.**

| Cause | Solution |
|---|---|
| A memory module is not installed in the XMM1 (or DIMM1) socket. | Ensure that a memory module is installed in the black XMM1 (or DIMM1) socket on the system board. This socket must be populated with a memory module. |
| Memory module is not the correct type or speed grade for the system or the new memory module is not seated properly. | Replace module with the correct industry-standard device for the computer. On some models, ECC and non-ECC memory modules cannot be mixed. |

**Out of memory error.**

| Cause | Solution |
|---|---|
| Memory configuration may not be set up correctly. | Use the Device Manager to check memory configuration. |
| You have run out of memory to run the application. | Check the application documentation to determine the memory requirements. |

**Memory count during POST is wrong.**

| Cause | Solution |
|---|---|
| The memory modules may not be installed correctly. | Check that the memory modules have been installed correctly and that proper modules are used. |
| Integrated graphics may use system memory. | No action required. |

**Table D-13 Solving Memory Problems (continued)**

**Insufficient memory error during operation.**

| Cause | Solution |
|---|---|
| Too many Terminate and Stay Resident programs (TSRs) are installed. | Delete any TSRs that you do not need. |
| You have run out of memory for the application. | Check the memory requirements for the application or add more memory to the computer. |

**Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

| Cause | Solution |
|---|---|
| Memory is installed incorrectly or is bad. | 1. Reseat DIMMs. Power on the system.<br>2. Replace DIMMs one at a time to isolate the faulty module.<br>3. Replace third-party memory with HP memory.<br>4. Replace the system board. |

# Solving Processor Problems

If you encounter processor problems, common causes and solutions are listed in the following table.

**Table D-14 Solving Processor Problems**

**Poor performance is experienced.**

| Cause | Solution |
|---|---|
| Processor is hot. | 1. Make sure the airflow to the computer is not blocked.<br>2. Make sure the fans are connected and working properly (some fans only operate when needed).<br>3. Make sure the processor heat sink is installed properly. |

**Power LED flashes Red three times, once every second, followed by a two second pause.**

| Cause | Solution |
|---|---|
| Processor is not seated properly or not installed. | 1. Check to see that the processor is present.<br>2. Reseat the processor. |

**Power LED flashes Red eleven times, once every second, followed by a two second pause.**

| Cause | Solution |
|---|---|
| The current processor does not support a feature previously enabled on this system. | 1. Install a TXT capable processor.<br>2. Disable TXT in the Computer Setup (F10) utility.<br>3. Reinstall the original processor. |

# Solving CD-ROM and DVD Problems

If you encounter CD-ROM or DVD problems, see the common causes and solutions listed in the following table or to the documentation that came with the optional device.

**Table D-15 Solving CD-ROM and DVD Problems**

**System will not boot from CD-ROM or DVD drive.**

| Cause | Solution |
|---|---|
| The device is attached to a SATA port that has been hidden in the Computer Setup utility. | Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Security** > **Device Security**. |
| Removable Media Boot is disabled in the Computer Setup utility. | Run the Computer Setup utility and enable booting to removable media in **Storage** > **Storage Options**. Ensure CD-ROM is enabled in **Storage** > **Boot Order**. |
| Network Server Mode is enabled in Computer Setup. | Run the Computer Setup utility and disable Network Server Mode in **Security** > **Password Options**. |
| Non-bootable CD in drive. | Try a bootable CD in the drive. |
| Boot order not correct. | Run the Computer Setup utility and change boot sequence in **Storage** > **Boot Order**. |

**Drive not found (identified).**

| Cause | Solution |
|---|---|
| Cable could be loose. | Check cable connections. |
| The system may not have automatically recognized a newly installed device. | See reconfiguration directions in the Solving Hardware Installation Problems on page 227 section. If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem.<br><br>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under **Advanced** > **Power-On Options**. |
| The device is attached to a SATA port that has been hidden in Computer Setup. | Run the Computer Setup utility and ensure **Device Available** is selected for the device's SATA port in **Security** > **Device Security**. |
| Drive responds slowly immediately after power-up. | Run Computer Setup and increase the POST Delay in **Advanced** > **Power-On Options**. |

**CD-ROM or DVD devices are not detected or driver is not loaded.**

| Cause | Solution |
|---|---|
| Drive is not connected properly or not properly configured. | See the documentation that came with the optional device. |

**Table D-15 Solving CD-ROM and DVD Problems (continued)**

**Movie will not play in the DVD drive.**

| Cause | Solution |
|---|---|
| Movie may be regionalized for a different country. | See the documentation that came with the DVD drive. |
| Decoder software is not installed. | Install decoder software. |
| Damaged media. | Replace media. |
| Movie rating locked out by parental lock. | Use DVD software to remove parental lock. |
| Media installed upside down. | Reinstall media. |

**Cannot eject compact disc (tray-load unit).**

| Cause | Solution |
|---|---|
| Disc not properly seated in the drive. | Turn off the computer and insert a thin metal rod into the emergency eject hole and push firmly. Slowly pull the tray out from the drive until the tray is fully extended, then remove the disc. |

**CD-ROM, CD-RW, DVD-ROM, or DVD-R/RW drive cannot read a disc or takes too long to start.**

| Cause | Solution |
|---|---|
| Media has been inserted upside down. | Re-insert the media with the label facing up. |
| The DVD-ROM drive takes longer to start because it has to determine the type of media played, such as audio or video. | Wait at least 30 seconds to let the DVD-ROM drive determine the type of media being played. If the disc still does not start, read the other solutions listed for this topic. |
| CD or DVD disc is dirty. | Clean CD or DVD with a CD cleaning kit, available from most computer stores. |
| Windows does not detect the CD-ROM or DVD-ROM drive. | 1. Use Device Manager to remove or uninstall the device.<br>2. Restart the computer and let Windows detect the CD or DVD driver. |

**Recording or copying CDs is difficult or impossible.**

| Cause | Solution |
|---|---|
| Wrong or poor quality media type. | 1. Try using a slower speed when recording.<br>2. Verify that you are using the correct media for the drive.<br>3. Try a different brand of media. Quality varies widely between manufacturers. |

**USDT computer boots too slow after removing a CD-ROM or DVD drive.**

| Cause | Solution |
|---|---|
| The system is searching for the drive during boot because the drive cable is still attached to the system board. | Disconnect the drive cable from the system board. |

# Solving USB Flash Drive Problems

If you encounter USB flash drive problems, common causes and solutions are listed in the following table.

**Table D-16 Solving USB Flash Drive Problems**

**USB flash drive is not seen as a drive letter in Windows.**

| Cause | Solution |
|---|---|
| The drive letter after the last physical drive is not available. | Change the default drive letter for the flash drive in Windows. |

**USB flash drive not found (identified).**

| Cause | Solution |
|---|---|
| The device is attached to a USB port that has been hidden in Computer Setup. | Run the Computer Setup utility and ensure that “Device available” is selected for “Front USB Ports” and “Rear USB Ports” under **Security** > **Device Security**. |
| The device was not properly seated before power-up. | Ensure the device is fully inserted into the USB port before applying power to the system |

**System will not boot from USB flash drive.**

| Cause | Solution |
|---|---|
| Boot order is not correct. | Run the Computer Setup utility and change boot sequence in **Storage** > **Boot Order**. |
| Removable Media Boot is disabled in the Computer Setup utility. | Run the Computer Setup utility and enable booting to removable media in **Storage** > **Storage Options**. Ensure USB is enabled in **Storage** > **Boot Order**. |
| The image on the device is not bootable. | Follow the procedures described in the “ROM Flash: Replicating the Setup: Creating a Bootable Device: Supported USB Flash Media Device” section of the *Service Reference Guide*. |

**The computer boots to DOS after making a bootable flash drive.**

| Cause | Solution |
|---|---|
| Flash drive is bootable. | Install the flash drive only after the operating system boots. |

# Solving Front Panel Component Problems

If you encounter problems with devices connected to the front panel, refer to the common causes and solutions listed in the following table.

**Table D-17 Solving Front Panel Component Problems**

**A USB device, headphone, or microphone is not recognized by the computer.**

| Cause | Solution |
|---|---|
| Device is not properly connected. | 1. Turn off the computer.<br>2. Reconnect the device to the front of the computer and restart the computer. |
| The device does not have power. | If the USB device requires AC power, be sure one end is connected to the device and one end is connected to a live outlet. |
| The correct device driver is not installed. | 1. Install the correct driver for the device.<br>2. You might need to reboot the computer. |
| The cable from the device to the computer does not work. | 1. If possible, replace the cable.<br>2. Restart the computer. |
| The device is not working. | 1. Replace the device.<br>2. Restart the computer. |
| USB ports on the computer are disabled in Computer Setup. | Run the Computer Setup utility and ensure that **Device available** is selected for appropriate USB ports under **Security > Device Security**. |

# Solving Internet Access Problems

If you encounter Internet access problems, consult your Internet Service Provider (ISP) or refer to the common causes and solutions listed in the following table.

**Table D-18 Solving Internet Access Problems**

**Unable to connect to the Internet.**

| Cause | Solution |
|---|---|
| Internet Service Provider (ISP) account is not set up properly. | Verify Internet settings or contact your ISP for assistance. |
| Modem is not set up properly. | Reconnect the modem. Verify the connections are correct using the quick setup documentation. |
| Web browser is not set up properly. | Verify that the Web browser is installed and set up to work with your ISP. |
| Cable/DSL modem is not plugged in. | Plug in cable/DSL modem. You should see a “power” LED light on the front of the cable/DSL modem. |
| Cable/DSL service is not available or has been interrupted due to bad weather. | Try connecting to the Internet at a later time or contact your ISP. (If the cable/DSL service is connected, the “cable” LED light on the front of the cable/DSL modem will be on.) |
| The CAT5 UTP cable is disconnected. | Connect the CAT5 UTP cable between the cable modem and the computers’s RJ-45 connector. (If the connection is good, the “PC” LED light on the front of the cable/DSL modem will be on.) |
| IP address is not configured properly. | Contact your ISP for the correct IP address. |
| Cookies are corrupted. (A “cookie” is a small piece of information that a Web server can store temporarily with the Web browser. This is useful for having the browser remember some specific information that the Web server can later retrieve.) | **Windows Vista**<br>1. Select **Start** > **Control Panel**.<br>2. Click **Network and Internet**.<br>3. Click **Internet Options**.<br>4. In the **Browsing history** section on the **General** tab, click the **Delete** button.<br>5. Click the **Delete cookies** button.<br>**Windows XP**<br>1. Select **Start** > **Control Panel**.<br>2. Double-click **Internet Options**.<br>3. On the **General** tab, click the **Delete Cookies** button. |

**Cannot automatically launch Internet programs.**

| Cause | Solution |
|---|---|
| You must log on to your ISP before some programs will start. | Log on to your ISP and launch the desired program. |

**Table D-18 Solving Internet Access Problems (continued)**

**Internet takes too long to download Web sites.**

| Cause | Solution |
|---|---|
| Modem is not set up properly. | Verify that the modem is connected and communicating properly.<br><br>**Windows XP**<br><br>1. Select **Start** > **Control Panel**.<br>2. Double-click **System**.<br>3. Click the **Hardware** tab.<br>4. In the **Device Manager** area, click the **Device Manager** button.<br>5. Double-click **Modems**.<br>6. Double-click **Agere Systems PCI-SV92PP Soft Modem**.<br>7. On the **General** tab, click **Diagnostics**.<br>8. Click **Query Modem**. A “Success” response indicates the modem is connected and working properly.<br><br>**Windows Vista**<br><br>1. Select **Start** > **Control Panel**.<br>2. Click on **System and Maintenance**.<br>3. Click on **System**.<br>4. In the **Tasks** list, select **Device Manager**.<br>5. Double-click **Modems**.<br>6. Double-click **Agere Systems PCI-SV92PP Soft Modem**.<br>7. On the **General** tab, click **Diagnostics**.<br>8. Click **Query Modem**. A “Success” response indicates the modem is connected and working properly. |

# Solving Software Problems

Most software problems occur as a result of the following:

- The application was not installed or configured correctly.
- There is insufficient memory available to run the application.
- There is a conflict between applications.
- Be sure that all the needed device drivers have been installed.
- If you have installed an operating system other than the factory-installed operating system, check to be sure it is supported on the system.

If you encounter software problems, see the applicable solutions listed in the following table.

**Table D-19 Solving Software Problems**

**Computer will not continue and no HP logo screen has appeared.**

| Cause | Solution |
|---|---|
| POST error has occurred. | Observe the beeps and LED lights on the front of the computer. See Appendix A, POST Error Messages on page 189 to determine possible causes.<br><br>See the Restore Kit or the Worldwide Limited Warranty for terms and conditions. |

**Computer will not continue after HP logo screen has appeared.**

| Cause | Solution |
|---|---|
| System files may be damaged. | Use recovery diskette to scan hard drive for errors. |

**“Illegal Operation has Occurred” error message is displayed.**

| Cause | Solution |
|---|---|
| Software being used is not Microsoft-certified for your version of Windows. | Verify that the software is certified by Microsoft for your version of Windows (see program packaging for this information). |
| Configuration files are corrupt. | If possible, save all data, close all programs, and restart the computer. |

# Contacting Customer Support

For help and service, contact an authorized reseller or dealer. To locate a reseller or dealer near you, visit http://www.hp.com.

**NOTE:** If you take the computer to an authorized reseller, dealer, or service provider for service, remember to provide the setup and power-on passwords if they are set.

Refer to the number listed in the warranty or in the *Support Telephone Numbers* guide for technical assistance.

# E Password Security and Resetting CMOS

This computer supports security password features, which can be established through the Computer Setup Utilities menu.

This computer supports two security password features that are established through the Computer Setup Utilities menu: setup password and power-on password. When you establish only a setup password, any user can access all the information on the computer except Computer Setup. When you establish only a power-on password, the power-on password is required to access Computer Setup and any other information on the computer. When you establish both passwords, only the setup password will give you access to Computer Setup.

When both passwords are set, the setup password can also be used in place of the power-on password as an override to log in to the computer. This is a useful feature for a network administrator.

If you forget the password for the computer, you can clear that password so you can gain access to the information on the computer by resetting the password jumper.

△ **CAUTION:** Pushing the CMOS button will reset CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup. See the *Computer Setup (F10) Utility Guide* for information on backing up the CMOS settings.

# Resetting the Password Jumper

To disable the power-on or setup password features, or to clear the power-on or setup passwords, complete the following steps:

1. Shut down the operating system properly, then turn off the computer and any external devices, and disconnect the power cord from the power outlet.
2. With the power cord disconnected, press the power button again to drain the system of any residual power.

⚠ **WARNING!** To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet, and allow the internal system components to cool before touching.

△ **CAUTION:** When the computer is plugged in, the power supply always has voltage applied to the system board even when the unit is turned off. Failure to disconnect the power cord can result in damage to the system.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

3. Remove the computer cover or access panel.
4. Locate the header and jumper.

**NOTE:** The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, see the Illustrated Parts & Service Map (IPSM) for that particular system. The IPSM can be downloaded from http://www.hp.com/support.

5. Remove the jumper from pins 1 and 2. Place the jumper on either pin 1 or 2, but not both, so that it does not get lost.
6. Replace the computer cover or access panel.
7. Reconnect the external equipment.
8. Plug in the computer and turn on power. Allow the operating system to start. This clears the current passwords and disables the password features.
9. To establish new passwords, repeat steps 1 through 4, replace the password jumper on pins 1 and 2, then repeat steps 6 through 8. Establish the new passwords in Computer Setup. Refer to the *Computer Setup (F10) Utility Guide* for Computer Setup instructions.

# Clearing and Resetting the CMOS

The computer's configuration memory (CMOS) stores information about the computer's configuration.

The CMOS button resets CMOS but does not clear the power-on and setup passwords.

Clearing CMOS will clear the Active Management Technology (AMT) settings in the Management Engine BIOS Extension (MEBx), including the password. The password will default to "admin" and will need to be reset. The AMT settings will also need to be reset. To access the MEBx, press Ctrl+P during POST.

1. Turn off the computer and any external devices, and disconnect the power cord from the power outlet.
2. Disconnect the keyboard, monitor, and any other external equipment connected to the computer.

⚠ **WARNING!** To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet, and allow the internal system components to cool before touching.

△ **CAUTION:** When the computer is plugged in, the power supply always has voltage applied to the system board even when the unit is turned off. Failure to disconnect the power cord can result in damage to the system.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

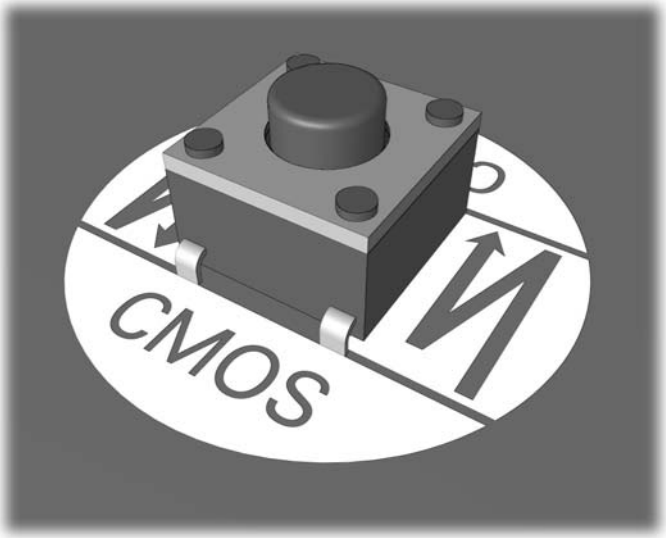
3. Remove the computer cover or access panel.

△ **CAUTION:** Pushing the CMOS button will reset CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup. See the *Computer Setup (F10) Utility Guide* for information on backing up the CMOS settings.

4. Locate, press, and hold the CMOS button in for five seconds.

**NOTE:** Make sure you have disconnected the AC power cord from the wall outlet. The CMOS button will not clear CMOS if the power cord is connected.

**Figure E-1** CMOS button




**NOTE:** For assistance locating the CMOS button and other system board components, see the Illustrated Parts & Service Map (IPSM) for that particular system.

5. Replace the computer cover or access panel.
6. Reconnect the external devices.
7. Plug in the computer and turn on power.

**NOTE:** You will receive POST error messages after clearing CMOS and rebooting advising you that configuration changes have occurred. Use Computer Setup to reset any special system setups along with the date and time.

For instructions on Computer Setup, see the *Computer Setup (F10) Utility Guide*.

# F Drive Protection System (DPS)

The Drive Protection System (DPS) is a diagnostic tool built into the hard drives installed in some computers. DPS is designed to help diagnose problems that might result in unwarranted hard drive replacement.

When these systems are built, each installed hard drive is tested using DPS, and a permanent record of key information is written onto the drive. Each time DPS is run, test results are written to the hard drive. Your service provider can use this information to help diagnose conditions that caused you to run the DPS software.

Running DPS will not affect any programs or data stored on the hard drive. The test resides in the hard drive firmware and can be executed even if the computer will not boot to an operating system. The time required to execute the test depends on the manufacturer and size of the hard drive; in most cases, the test will take approximately two minutes per gigabyte.

Use DPS when you suspect a hard drive problem. If the computer reports a SMART Hard Drive Detect Imminent Failure message, there is no need to run DPS; instead, back up the information on the hard drive and contact a service provider for a replacement hard drive.

# Accessing DPS Through Computer Setup

When the computer does not power on properly you should use Computer Setup to access the DPS program. To access DPS, perform the following steps:

1. Turn on or restart the computer.
2. When the F10 Setup message appears in the lower-right corner of the screen, press the F10 key.

**NOTE:** If you do not press the F10 key while the message is displayed, you must turn the computer off, then on again, to access the utility.

A choice of five headings appears in the Computer Setup Utilities menu: **File**, **Storage**, **Security**, **Power**, and **Advanced**.

3. Select **Storage** > **DPS Self-Test**.

The screen will display the list of DPS-capable hard drives that are installed on the computer.

**NOTE:** If no DPS-capable hard drives are installed, the **DPS Self-Test** option will not appear on the screen.

4. Select the hard drive to be tested and follow the screen prompts to complete the testing process.

When the test has been completed, one of three messages will be displayed:

- Test Succeeded. Completion Code 0.
- Test Aborted. Completion Code 1 or 2.
- Test Failed. Drive Replacement Recommended. Completion Code 3 through 14.

If the test failed, the completion code should be recorded and reported to your service provider for help in diagnosing the computer problem.

# G Computer Diagnostic Features

## Hewlett-Packard Vision Diagnostics

**NOTE:** HP Vision Diagnostics is included on CD with some computer models only.

The Hewlett-Packard Vision Diagnostics utility allows you to view information about the hardware configuration of the computer and perform hardware diagnostic tests on the subsystems of the computer. The utility simplifies the process of effectively identifying, diagnosing, and isolating hardware issues.

The Survey tab is displayed when you invoke HP Vision Diagnostics. This tab shows the current configuration of the computer. From the Survey tab, there is access to several categories of information about the computer. Other tabs provide additional information, including diagnostic test options and test results. The information in each screen of the utility can be saved as an html file and stored on a USB flash drive.

Use HP Vision Diagnostics to determine if all the devices installed on the computer are recognized by the system and functioning properly. Running tests is optional but recommended after installing or connecting a new device.

You should run tests, save the test results, and print them so that you have printed reports available before placing a call to the Customer Support Center.

**NOTE:** Third party devices may not be detected by HP Vision Diagnostics.

### Accessing HP Vision Diagnostics

To access HP Vision Diagnostics, you must create a Recovery Disc Set then boot to the CD containing the utility. It can also be downloaded from http://www.hp.com and either burned to CD or installed to a USB flash drive. See Downloading the Latest Version of HP Vision Diagnostics on page 253 for more information.

**NOTE:** HP Vision Diagnostics is included as part of the Recovery Disk Set with some computer models only.

If you have already downloaded HP Vision Diagnostics to either CD or USB Flash drive, then begin the following procedure at step 2.

1. In Windows Explorer, go to **C:\SWSetup\ISOs** and burn the file **Vision Diagnostics.ISO** to a CD or copy it to a USB flash drive.
2. While the computer is on, insert the CD in the Optical Drive or USB flash drive in a USB port on the computer.
3. Shut down the operating system and turn off the computer.

4. Turn on the computer. The system will boot into HP Vision Diagnostics.

**NOTE:** If the system does not boot to the CD in the optical drive or to the USB flash drive, you may need to change the boot order in the Computer Setup (F10) utility. Refer to the *Computer Setup (F10) Utility Guide* for more information.

5. At the boot menu, select either the **HP Vision Diagnostics** utility to test the various hardware components in the computer or the **HP Memory Test** utility to test memory only.

**NOTE:** The HP Memory Test is a comprehensive memory diagnostic utility that is run as a stand-alone application, outside of HP Vision Diagnostics.

6. If running **HP Vision Diagnostics**, select the appropriate language and click **Continue**.

7. In the End User License Agreement page, select **Agree** if you agree with the terms. The HP Vision Diagnostics utility launches with the Survey tab displayed.

## Survey Tab

The Survey tab displays important system configuration information.

In the **View level** field, you can select the **Summary** view to see limited configuration data or select the **Advanced** view to see all the data in the selected category. By default, the View Level is set to **Overview** which displays general information about all of the component categories.

In the **Category** field, you can select the following categories of information to display:

**All**—Gives a listing of all categories of information about the computer.

**Architecture**—Provides system BIOS and PCI device information.

**Asset Control**—Shows product name, system serial number, asset tag and universal unique ID information.

**Audio**—Displays information about the audio controllers present in the system, including PCI audio cards.

**Communication**—Shows information about the computer parallel (LPT) and serial (COM) port settings, plus USB and network controller information.

**Graphics**—Shows information about the graphics controller of the computer.

**Input Devices**—Shows information about the keyboard, mouse, and other input devices connected to the computer.

**Memory**—Shows information about all memory in the computer. This includes memory slots on the system board and any memory modules installed.

**Processors**—Shows information about the processor(s) installed in the computer, including clock speeds and cache sizes.

**Storage**—Shows information about storage media connected to the computer. This list includes all hard drives and optical drives.

**System**—Shows information about the computer model, internal fans, chassis, and BIOS.

## Test Tab

The Test tab allows you to choose various parts of the system to test. You can also choose the type of test and testing mode.

There are three types of tests to choose from:

- **Quick Test**—Provides a predetermined script where a sample of each hardware component is exercised. You may further modify which of the Quick tests are executed by selecting or deselecting individual tests in the hardware component check list.
- **Complete Test**—Provides a predetermined script where each hardware component is fully tested. You may further modify which of the Complete tests are executed by selecting or deselecting individual tests in the hardware component check list.
- **Custom Test**—Provides the most flexibility in controlling the testing of a system. The Custom Test mode allows you to specifically select which devices, tests, and test parameters are run.

By default, the three test modes do not display prompts and require no interaction. If errors are found, they are displayed when testing is complete.

However, for each test type, you may also optionally add interactive tests by clicking the **Include interactive tests** box under **Test mode**. Selecting interactive tests provides the maximum control over the testing process. The diagnostic software will prompt you for input during tests.

**NOTE:** Memory can not be tested from within the HP Vision Diagnostics application. To test the memory in your computer, you must exit HP Vision Diagnostics, boot to either the CD or USB flash drive and select **HP Memory Test** from the boot menu.

To begin testing:

1. Select the Test tab.
2. Select the type of tests you want to run: **Quick**, **Complete**, or **Custom**.
3. Include optional interactive tests by selecting **Include interactive tests**.
4. Choose how you want the test to be executed, either **Number of Loops** or **Total Test Time**. When choosing to run the test over a specified number of loops, enter the number of loops to perform. If you want the diagnostic test for a specified time period, enter the amount of time in minutes.
5. Click the **Start Test** button to start the testing. The Status tab, which allows you to monitor the progress of the tests, is automatically displayed during the testing process. When the tests are complete, the Status tab shows whether the devices passed or failed.
6. If errors are found, go to the Errors tab to display detailed information and recommended actions.

## Status Tab

The Status tab displays the status of the selected tests. The main progress bar displays the percent complete of the current set of tests. While testing is in progress, a **Cancel Testing** button is displayed for use if you want to cancel the test.

The Status tab also shows:

- The devices being tested
- The test status (running, waiting, passed, or failed) of each device being tested
- The overall test progress of all devices being tested
- The test progress for each device being tested
- The elapsed test times for each device being tested

## History Tab

The History tab contains information on past test executions.

The History Log displays all tests that have been executed, the number of times of execution, the number of times failed, the date each test was executed, and the time it took to complete each test. The **Clear History** button will clear the contents of the History Log.

The contents of the History Log may be saved as a HTML file to USB flash drive by clicking the **Save** button.

## Errors Tab

The Errors tab displays detailed information about any errors found, as well as any recommended actions.

The Error Log displays the tests for devices that have failed during the diagnostic testing and includes the following columns of information.

- The **Device** section displays the device tested.
- The **Test** section displays the type of test run.
- The **Times Failed** is the number of times the device has failed a test.
- The **Defect Code** provides a numerical code for the failure. The error codes are defined in the Help tab.
- The **Description** section describes the error that the diagnostic test found.
- The **Reason** section describes the likely cause of the error.
- The **Recommended Repair** will give a recommended action that should be performed to resolve the failed hardware.
- The **Warranty ID** is a unique error code associated with the specific error on your computer. When contacting the HP Support Center for assistance with a hardware failure, please be prepared to provide the Warranty ID.

The **Clear Errors** button will clear the contents of the Error Log.

The contents of the Error Log may be saved as a HTML file to USB flash drive by clicking the **Save** button.

## Help Tab

The Help tab contains a **Vision Help** section, and a **Test Components** section. This tab includes search and index features. You may also review the HP End User License Agreement (EULA), as well as the HP Vision Diagnostic application version information on this tab.

The **Vision Help** section contains information on the major functions of Hewlett-Packard Vision Diagnostics.

The **Test Components** section provides a description of each test, as well as the parameters that may be adjusted when running in Custom test mode.

The **Defect codes** section contains information on the numerical error code that may appear in the Errors tab.

The **Memory test tab** section provides information on the **HP Memory Test** application that may be launched from the boot menu.

The **HP Support** section provides information on obtaining technical support from HP.

## Saving and Printing Information in HP Vision Diagnostics

You can save the information displayed in the HP Vision Diagnostics **Survey**, **History** and **Errors** tabs to a USB flash drive. You can not save to the hard drive. The system will automatically create an html file that has the same appearance as the information displayed on the screen.

1. Insert a USB flash drive if running HP Vision Diagnostics from CD.
2. Click **Save** in the bottom on any of the **Survey**, **History** or **Errors** tabs. All three log files will be saved regardless of from which tab the Save button was clicked.
3. Select the drive onto which you will save the log files and click the **Save** button. Three html files will be saved to the inserted USB flash drive.

   **NOTE:** Do not remove the USB flash drive until you see a message indicating that the html files have been written to the media.

4. Print the desired information from the storage device used to save it.

**NOTE:** To exit HP Vision Diagnostics, click the **Exit Diagnostics** button at the bottom of the screen. Be sure to remove the USB flash drive or CD from the optical drive.

## Downloading the Latest Version of HP Vision Diagnostics

1. Go to http://www.hp.com.
2. Click the **Software & Drivers** link.
3. Select **Download drivers and software (and firmware)**.
4. Enter your product name in the text box and press the Enter key.
5. Select your specific computer model.
6. Select your OS.
7. Click the **Diagnostic** link.

8. Click the **Hewlett-Packard Vision Diagnostics** link.

9. Click the **Download** button.

**NOTE:** The download includes instructions on how to create the bootable CD or the bootable USB flash drive.

# Protecting the Software

To protect software from loss or damage, you should keep a backup copy of all system software, applications, and related files stored on the hard drive. See the operating system or backup utility documentation for instructions on making backup copies of data files.

# H Backup and Recovery

## Windows 7 – Backup and Recovery

To protect your information, use Windows® Backup and Restore to back up individual files and folders, back up your entire hard drive (select models only), create system repair discs (select models only), or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

Windows Backup and Restore provides the following options:

- Creating a system repair disc (select models only)
- Backing up individual files and folders
- Creating a system image (select models only)
- Scheduling automatic backups (select models only)
- Creating system restore points
- Recovering individual files
- Restoring the computer to a previous state
- Recovering information using recovery tools

**NOTE:** For detailed instructions, perform a search for these topics in Help and Support.

**NOTE:** In case of system instability, HP recommends that you print the recovery procedures and save them for later use.

### Backing up your information

Recovery after a system failure is as complete as your most current backup. You should create system repair discs (select models only) and your initial backup immediately after software setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup. The system repair discs (select models only) are used to start up (boot) the computer and repair the operating system in case of system instability or failure. Your initial and subsequent backups allow you to restore your data and settings if a failure occurs.

You can back up your information to an optional external hard drive, a network drive, or discs.

Note the following when backing up:

- Store personal files in the Documents library, and back it up regularly.
- Back up templates that are stored in their associated programs.

- Save customized settings that appear in a window, toolbar, or menu bar by taking a screen shot of your settings. The screen shot can be a time-saver if you have to reset your preferences.

  To create a screen shot:

  1. Display the screen you want to save.
  2. Copy the screen image:

     To copy only the active window, press **alt+fn+prt sc**.

     To copy the entire screen, press **fn+prt sc**.
  3. Open a word-processing document, and then select **Edit > Paste**.

     The screen image is added to the document.
  4. Save the document.

- When backing up to discs, use any of the following types of discs (purchased separately): CD-R, CD-RW, DVD+R, DVD+R DL, DVD-R, DVD-R DL, or DVD±RW. The discs you use will depend on the type of optical drive installed in your computer.

  **NOTE:** DVDs and DVDs with double-layer (DL) support store more information than CDs, so using them for backup reduces the number of recovery discs required.

- When backing up to discs, number each disc before inserting it into the optical drive of the computer.

To create a backup using Backup and Restore, follow these steps:

**NOTE:** Be sure that the computer is connected to AC power before you start the backup process.

**NOTE:** The backup process may take over an hour, depending on file size and the speed of the computer.

1. Select **Start > All Programs > Maintenance > Backup and Restore**.
2. Follow the on-screen instructions to set up your backup, create a system image (select models only), or create a system repair disc (select models only).

**NOTE:** Windows® includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support for more information.

## Performing a recovery

In case of system failure or instability, the computer provides the following tools to recover your files:

- Windows recovery tools: You can use Windows Backup and Restore to recover information you have previously backed up. You can also use Windows Startup Repair to fix problems that might prevent Windows from starting correctly.
- f11 recovery tools: You can use the f11 recovery tools to recover your original hard drive image. The image includes the Windows operating system and software programs installed at the factory.

**NOTE:** If you are unable to boot (start up) your computer and you cannot use the system repair discs you previously created (select models only), you must purchase a Windows 7 operating system DVD to reboot the computer and repair the operating system. For additional information, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

## Using the Windows recovery tools

To recover information you previously backed up, follow these steps:

1. Select **Start > All Programs > Maintenance > Backup and Restore**.
2. Follow the on-screen instructions to recover your system settings, your computer (select models only), or your files.

**NOTE:** Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support for more information.

To recover your information using Startup Repair, follow these steps:

△ **CAUTION:** Using Startup Repair completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. When reformatting is complete, the recovery process restores the operating system, as well as the drivers, software, and utilities from the backup used for recovery.

1. If possible, back up all personal files.
2. If possible, check for the presence of the Windows partition and the HP Recovery partition.

   To check for the Windows partition, select **Start > Computer**.

   To check for the HP Recovery partition, select **Start**, right-click **Computer**, click **Manage**, and then click **Disk Management**.

   **NOTE:** If the Windows partition and the HP Recovery partition are not listed, you must recover your operating system and programs using the Windows 7 operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

3. If the Windows partition and the HP Recovery partition are listed, restart the computer, and then press f8 before the Windows operating system loads.
4. Select **Startup Repair**.
5. Follow the on-screen instructions.

**NOTE:** For additional information on recovering information using the Windows tools, perform a search for these topics in Help and Support.

## Using f11

△ **CAUTION:** Using f11 completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. The f11 recovery tool reinstalls the operating system and HP programs and drivers that were installed at the factory. Software not installed at the factory must be reinstalled.

To recover the original hard drive image using f11, follow these steps:

1. If possible, back up all personal files.
2. If possible, check for the presence of the HP Recovery partition: select **Start**, right-click **Computer**, click **Manage**, and then click **Disk Management**.

   **NOTE:** If the HP Recovery partition is not listed, you must recover your operating system and programs using the Windows 7 operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

3. If the HP Recovery partition is listed, restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
4. Press f11 while the “Press <F11> for recovery” message is displayed on the screen.
5. Follow the on-screen instructions.

## Using a Windows 7 operating system DVD (purchased separately)

If you are unable to boot (start up) your computer and you cannot use the system repair discs you previously created (select models only), you must purchase a Windows 7 operating system DVD to reboot the computer and repair the operating system. Make sure that your most recent backup (stored on discs or on an external drive) is easily accessible.

△ **CAUTION:** Using a Windows 7 operating system DVD completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. When reformatting is complete, the recovery process helps you restore the operating system, as well as drivers, software, and utilities.

To initiate recovery using a Windows 7 operating system DVD, follow these steps:

**NOTE:** This process takes several minutes.

1. If possible, back up all personal files.
2. Restart the computer, and then insert the Windows 7 operating system DVD into the optical drive before the Windows operating system loads.
3. When prompted, press any keyboard key.
4. Follow the on-screen instructions.
5. Click **Next**.
6. Select **Repair your computer**.
7. Follow the on-screen instructions.

# Windows Vista – Backup and Recovery

To protect your information, use the Backup and Restore Center to back up individual files and folders, back up your entire hard drive (select models only), or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

The Backup and Restore Center provides the following options:

- Backing up individual files and folders
- Backing up the entire hard drive (select models only)
- Scheduling automatic backups (select models only)
- Creating system restore points
- Recovering individual files
- Restoring the computer to a previous state
- Recovering information using recovery tools

**NOTE:** For detailed instructions, perform a search for these topics in Help and Support.

**NOTE:** In case of system instability, HP recommends that you print the recovery procedures and save them for later use.

## Backing up your information

Recovery after a system failure is as complete as your most current backup. You should create your initial backup immediately after software setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup.

You can back up your information to an optional external hard drive, a network drive, or discs.

Note the following when backing up:

- Store personal files in the Documents folder, and back it up regularly.
- Back up templates that are stored in their associated programs.
- Save customized settings that appear in a window, toolbar, or menu bar by taking a screen shot of your settings. The screen shot can be a time-saver if you have to reset your preferences.

  To create a screen shot:

  1. Display the screen you want to save.
  2. Copy the screen image:

     To copy only the active window, press **alt+fn+prt sc**.

     To copy the entire screen, press **fn+prt sc**.
  3. Open a word-processing document, and then select **Edit > Paste**.

     The screen image is added to the document.
  4. Save the document.

- When backing up to discs, use any of the following types of discs (purchased separately): CD-R, CD-RW, DVD+R, DVD+R DL, DVD-R, DVD-R DL, or DVD±RW. The discs you use will depend on the type of optical drive installed in your computer.

**NOTE:** DVDs and DVDs with double-layer (DL) support store more information than CDs, so using them for backup reduces the number of recovery discs required.

- When backing up to discs, number each disc before inserting it into the optical drive of the computer.

To create a backup using Backup and Restore Center, follow these steps:

**NOTE:** Be sure that the computer is connected to AC power before you start the backup process.

**NOTE:** The backup process may take over an hour, depending on file size and the speed of the computer.

1. Select **Start > All Programs > Maintenance > Backup and Restore Center**.
2. Follow the on-screen instructions to back up your entire computer (select models only) or your files.

**NOTE:** Windows® includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support for more information.

## Performing a recovery

In case of system failure or instability, the computer provides the following tools to recover your files:

- Windows recovery tools: You can use the Backup and Restore Center to recover information you have previously backed up. You can also use Windows Startup Repair to fix problems that might prevent Windows from starting correctly.
- f11 recovery tools: You can use the f11 recovery tools to recover your original hard drive image. The image includes the Windows operating system and software programs installed at the factory.

**NOTE:** If you are unable to boot (start up) your computer, you must purchase a Windows Vista® operating system DVD to reboot the computer and repair the operating system. For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

### Using the Windows recovery tools

To recover information you previously backed up, follow these steps:

1. Click **Start > All Programs > Maintenance > Backup and Restore Center**.
2. Follow the on-screen instructions to recover your entire computer (select models only) or your files.

**NOTE:** Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support for more information.

To recover your information using Startup Repair, follow these steps:

△ **CAUTION:** Using Startup Repair completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. When reformatting is complete, the recovery process restores the operating system, as well as the drivers, software, and utilities from the backup used for recovery.

1. If possible, back up all personal files.
2. If possible, check for the presence of the Windows partition and the HP Recovery partition. To find the partitions, select **Start > Computer**.

   **NOTE:** If the Windows partition and the HP Recovery partition have been deleted, you must recover your operating system and programs using the Windows Vista operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

3. Restart the computer, and then press f8 before the Windows operating system loads.
4. Select **Repair your computer**.
5. Follow the on-screen instructions.

**NOTE:** For additional information on recovering information using the Windows tools, perform a search for these topics in Help and Support.

## Using f11

△ **CAUTION:** Using f11 completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. The f11 recovery tool reinstalls the operating system and HP programs and drivers that were installed at the factory. Software not installed at the factory must be reinstalled.

To recover the original hard drive image using f11, follow these steps:

1. If possible, back up all personal files.
2. If possible, check for the presence of the HP Recovery partition. To find the partition, select **Start > Computer**.

   **NOTE:** If the HP Recovery partition has been deleted, you must recover your operating system and programs using the Windows Vista operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

3. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
4. Press f11 while the “Press <F11> for recovery” message is displayed on the screen.
5. Follow the on-screen instructions.

## Using a Windows Vista operating system DVD (purchased separately)

If you are unable to boot (start up) your computer, you must purchase a Windows Vista operating system DVD to reboot the computer and repair the operating system. Make sure that your most recent backup (stored on discs or on an external drive) is easily accessible.

△ **CAUTION:** Using a Windows Vista operating system DVD completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. When reformatting is complete, the recovery process helps you restore the operating system, as well as drivers, software, and utilities.

To initiate recovery using a Windows Vista operating system DVD, follow these steps:

**NOTE:** This process takes several minutes.

1. If possible, back up all personal files.
2. Restart the computer, and then insert the Windows Vista operating system DVD into the optical drive before the Windows operating system loads.
3. When prompted, press any keyboard key.
4. Follow the on-screen instructions.
5. Click **Next**.
6. Select **Repair your computer**.
7. Follow the on-screen instructions.

# I Specifications

## CMT Specifications

**Table I-1 Specifications**

| | | |
|---|---|---|
| **Desktop Dimensions** | | |
| Height | 7.0 in | 17.78 cm |
| Width | 17.63 in | 44.78 cm |
| Depth | 17.5 in | 44.45 cm |
| **Tower Dimensions** | | |
| Height | 17.63 in | 44.78 cm |
| Width | 7.0 in | 17.78 cm |
| Depth | 17.5 in | 44.45 cm |
| **Approximate Weight** | 24.54 lb | 11.15 kg |
| **Weight Supported** (maximum distributed load in desktop position) | 77 lb | 35 kg |
| **Temperature Range** | | |
| Operating | 50° to 95°F | 10° to 35°C |
| Nonoperating | -22° to 140°F | -30° to 60°C |
| **NOTE:** Operating temperature is derated 1.0° C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10° C/Hr. The upper limit may be limited by the type and number of options installed. | | |
| **Relative Humidity (noncondensing)** | | |
| Operating | 10-90% | 10-90% |
| Nonoperating (38.7°C max wet bulb) | 5-95% | 5-95% |
| **Maximum Altitude (unpressurized)** | | |
| Operating | 10,000 ft | 3048 m |
| Nonoperating | 30,000 ft | 9144 m |

**Table I-1 Specifications (continued)**

| | | |
|---|---|---|
| **Heat Dissipation** | | |
| Max STD PS | 1410 BTU/hr | 356 kg-cal/hr |
| Typical STD PS idle | 222 BTU/hr | 56 kg-cal/hr |
| Max EPA 87/89/85% @ 20/50/100% load PS | 1255 BTU/hr | 316 kg-cal/hr |
| Typical EPA 87/89/85% @ 20/50/100% load PS idle | 171 BTU/hr | 43 kg-cal/hr |
| **Power Supply** | **115V** | **230V** |
| Operating Voltage Range (STD PS) | 90-264 VAC | 90-264 VAC |
| Operating Voltage Range (EPA 87/89/85% @ 20/50/100% load PS) | 90-264 VAC | 90-264 VAC |
| Rated Voltage Range (STD PS) | 100-240 VAC | 100-240 VAC |
| Rated Voltage Range (EPA 87/89/85% @ 20/50/100% load PS) | 100-240 VAC | 100-240 VAC |
| Rated Line Frequency | 50-60 Hz | 50-60 Hz |
| **Power Output** | 320W | 320W |
| **Rated Input Current (maximum)**[1] | | |
| STD PS | 5.5A @ 115 VAC | 2.75A @ 230 VAC |
| EPA 87/89/85% @ 20/50/100% load PS | 5.5A @ 115 VAC | 2.75A @ 230 VAC |

[1] This system utilizes an active power factor corrected power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor corrected power supply also has the added benefit of not requiring an input voltage range select switch.

# SFF Specifications

**Table I-2 Specifications**

| | | |
|---|---|---|
| **Desktop Dimensions** (in the desktop position) | | |
| Height | 3.95 in | 10.0 cm |
| Width | 13.3 in | 33.8 cm |
| Depth | 14.9 in | 37.8 cm |
| **Approximate Weight** | 16.72 lb | 7.6 kg |
| **Weight Supported** (maximum distributed load in desktop position) | 77 lb | 35 kg |
| **Temperature Range** | | |
| Operating | 50° to 95°F | 10° to 35°C |
| Nonoperating | -22° to 140°F | -30° to 60°C |
| **NOTE:** Operating temperature is derated 1.0° C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10° C/Hr. The upper limit may be limited by the type and number of options installed. | | |
| **Relative Humidity (noncondensing)** | | |
| Operating | 10-90% | 10-90% |
| Nonoperating (38.7°C max wet bulb) | 5-95% | 5-95% |
| **Maximum Altitude (unpressurized)** | | |
| Operating | 10,000 ft | 3048 m |
| Nonoperating | 30,000 ft | 9144 m |
| **Heat Dissipation** | | |
| Max STD PS | 1063 BTU/hr | 268 kg-cal/hr |
| Typical STD PS idle | 198 BTU/hr | 50 kg-cal/hr |
| Max EPA 87/89/85% @ 20/50/100% load PS | 941 BTU/hr | 237 kg-cal/hr |
| Typical EPA 87/89/85% @ 20/50/100% load PS idle | 150 BTU/hr | 38 kg-cal/hr |
| **Power Supply** | **115V** | **230V** |
| Operating Voltage Range (STD PS) | 90-264 VAC | 90-264 VAC |
| Operating Voltage Range (EPA 87/89/85% @ 20/50/100% load PS) | 90-264 VAC | 90-264 VAC |
| Rated Voltage Range (STD PS) | 100-240 VAC | 100-240 VAC |
| Rated Voltage Range (EPA 87/89/85% @ 20/50/100% load PS) | 100-240 VAC | 100-240 VAC |
| Rated Line Frequency | 50-60 Hz | 50-60 Hz |
| **Power Output** | 240W | 240W |

**Table I-2 Specifications (continued)**

| | | |
|---|---|---|
| **Rated Input Current (maximum)**[1] | | |
| STD PS | 4A @ 100 VAC | 2A @ 230 VAC |
| EPA 87/89/85% @ 20/50/100% load PS | 4A @ 100 VAC | 2A @ 230 VAC |

[1] This system utilizes an active power factor corrected power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor corrected power supply also has the added benefit of not requiring an input voltage range select switch.

# USDT Specifications

**Table I-3 Specifications**

| | | |
|---|---|---|
| **Desktop Dimensions** (in the desktop position) | | |
| Height | 2.60 in | 6.6 cm |
| Width | 9.90 in | 25.1 cm |
| Depth | 10.00 in | 25.4 cm |
| (depth will increase if the computer is equipped with a port security bracket) | | |
| **Approximate Weight** | 6.75 lb | 3.07 kg |
| **Weight Supported** (maximum distributed load in desktop position) | 77 lb | 35 kg |
| **Temperature Range** (values subject to change with increasing altitude above sea level) | | |
| Operating | 50° to 95° F | 10° to 35° C |
| Nonoperating | -22° to 140° F | -30° to 60° C |
| **NOTE:** Operating temperature is derated 1.0° C per 300 m (1,000 ft) to 3,000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10° C (50° F)/Hr. The upper limit may be limited by the type and number of options installed. | | |
| **Relative Humidity** (noncondensing) | | |
| Operating (28° C (82.4° F) max wet bulb) | 10-90% | 10-90% |
| Nonoperating (38.7° C (101.66° F) max wet bulb) | 5-95% | 5-95% |
| **Maximum Altitude** (unpressurized) | | |
| Operating | 10,000 ft | 3,048 m |
| Nonoperating | 30,000 ft | 9,144 m |
| **Heat Dissipation** | | |
| Maximum | 549 BTU/hr | 132 kg-cal/hr |
| Typical (idle) | 133 BTU/hr | 33.5 kg-cal/hr |
| **Power Supply** | | |
| Operating Voltage Range | 90-264 VAC | |
| Rated Voltage Range[1] | 100-240 VAC | |
| Rated Line Frequency | 50-60 Hz | |

**Table I-3 Specifications (continued)**

| | | |
|---|---|---|
| **Power Output** | 135 W | |
| **Rated Input Current** (maximum)[1] | 2.4A @ 100VAC | 1.2A @ 200VAC |

[1] This system utilizes an active power factor corrected external power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor corrected power supply also has the added benefit of not requiring an input voltage range select switch.

# Index